YOUR HEALTH AND GROWTH SERIES

A Sound Body

SECOND REVISED EDITION

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THE MACMILLAN COMPANY • NEW YORK

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PRINTED IN THE UNITED STATES OF AMERICA

MAY PRINTING 1955

FOREWORD TO THE TEACHER

CHECKED 1981

In the days when subjects followed conventional patterns, it was an easy matter to write textbooks. The authors attempted to make the content as simple as they could and expected the children to master what was set before them. But the subject matter itself was completely prescribed by the specialists who worked in the field.

More recently the problems of textbook authors have greatly increased in complexity. Accepting the current theory of education that the content of textbooks and courses of study should be based upon the needs and interests of children, they must radically change the old conventional subject matter. Consideration has been given to what the children need, in what grades it will be of the most interest to children, how the information can be translated into habits, the degree of difficulty of the vocabulary, and a score of other considerations.

Consequently in the preparation of the *Health and Growth Series,* of which the present books are a revision, exhaustive basic studies of a wide variety were carried on over an extended period of time:

Statistics concerning the incidence of children's diseases and accidents were collected and interpreted to provide an indication of the school age at which materials upon these subjects should be most appropriately taught. Health columns in newspapers and health bulletins for laymen were analyzed to discover the vocabulary children should be taught to enable them to continue to read intelligently popular health articles after graduation and in adult life. The difficulty of words was ascertained for each grade to enable the authors to use words known by eighty per cent of the class, except necessary technical terms, which would be carefully explained.

The initial purpose of this series is to interest the child in living healthfully. The primary method of creating this interest is to teach a unit when the learner sees a good reason for its introduction—precautions when colds are in season, safety in the "accident years" of childhood. Supplementary methods are legion. They include of course illustrations that depict real health situations.

A second objective is to establish specific, flexible habits of healthful living. What one *does* is of more importance than what one *knows*. Good health is maintained by actions and not by knowledge alone. To acquire flexible habits of right living, no time is so opportune as the period of childhood. All methods of habit building should be used—interest in the activity, an understanding of its physiological purpose, repetition until essential daily routines are established, use in varied situations, and satisfaction in the outcome. The mental hygiene and the social aspects are given special emphasis.

A third objective of major importance is to furnish the child with the latest scientific information about health and disease. Much misinformation is still prevalent in the homes of the nation. This can be eradicated in the next generation only provided that the child learns proved facts in the schoolroom. Much can be eradicated in the homes of this generation by the practice of having the child read his texts with his parents.

In preparing the first thoroughly revised and completely reorganized edition, *New Health and Growth Series*, the authors considered the health subjects for which there was increasing need in our schools. Believing that the interest in safety education should be utilized and that the subject should be taught in the elementary school grades as units in many courses at appropriate points rather than in added independent courses,. the authors included a generous amount of information about the methods of assuring safety as related to health in the prevention of accidents and about the reasonableness of the rules that were presented.

In sympathy with the attention that was belatedly being given conservation and consumer education by the schools and believing, as in the case of safety education, that these desirable fields should be treated in the elementary grades as units of already existing courses, the authors devoted substantial space to conservation as applied to health and endeavored to teach the children to become skillful in getting the best for their money and their effort in matters of health and its accessories—food, clothing, vacations, recreations, medicines.

During war years, health knowledge advances rapidly. This was true in World War II. Especially in the fields of nutrition and disease prevention and control, important discoveries were made. Among these were the newer knowledge of the vitamins, the sulfa drugs, the medicinal molds—penicillin and streptomycin—and DDT and related preparations for combating insect pests. These subjects and other recently reported health knowledge are now incorporated in *Your Health and Growth Series.* In the present revision improvements have also been made along these lines: (1) the organization of content, (2) the further simplification of vocabulary and sentence structure, (3) the emphasis on the most pressing postwar health needs and on the solution of local health problems, and (4) the recognition of social and vocational motives for healthful living and the importance of each pupil's taking more responsibility for his own health and for the health of others.

The authors are indebted to many sources for the materials which they examined in their search for scientific and practical materials. Particularly they acknowledge the use of data from the writings of the National Safety Council, the American Red Cross, and the study of accidents of school children made by Miss Jeanie M. Pinckney, Chief of the Bureau of Nutrition and Health Education, Division of Extension, University of Texas. Special acknowledgment is also made to Mrs. Helene Searcy Puls and Miss Leslie Hunt for assistance with the books for the lower grades and to Miss Leslie Hunt and Mrs. George MacLeod for their contributions to the last book in the series.

All color photographs were supplied by Shostal and

taken by the following photographers: Robert Holland, Ray Philbrick, Jr., John W. Swezey, L. Willinger. Acknowledgment is due for specific photographs to the following: Admiral Corporation, facing page 55; American Red Cross, page 69 and facing page 87; Army Medical Museum, pages 57 and 198; Atlas Photos, page 169; Bausch & Lomb Optical Company, page 129; Black Star, pages 12 and 174; Bloom, from Monkmeyer, page 21; Boy Scouts of America, facing page 215; Department of Water Supply, Gas, and Electricity, City of New York, facing page 247; Eriss from Monkmeyer Press Photo Service, page 7; Free-Lance Photographers Guild, pages 101, 173, 278, and 303; Ewing Galloway, pages 18, 142, 159, 182, 223, 225, 246, 277, 304 and facing page 151; Philip Gendreau, pages 86 and 141; General Electric Company, page 43; Grace Line, page 188; Keystone View Company, page 21; J. W. McManigal from Gendreau, page 14; Monkmeyer Press Photo Service, page 1; National Girl Scout News Bureau (Paul Parker Photo), page 2 and facing page 23; Pincus Rice, page 93; Pullman Company, pages 189; H. Armstrong Roberts, page 298; Sealtest Consumer Service, page 93; Tennessee Valley Authority, page 245; and U. S. Public Health Service, page 22. For the use of facilities supplied for the photographs acknowledgment is due also to Bausch & Lomb Optical Company; Essex House, New York City; Arthur Kudner, Inc. (Florida Citrus Commission and General Motors Corporation); F. A. O. Schwarz, New York City; S. S. White Dental Manufacturing Company; and Adolph Zukor Estate, New York City.

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YOUR WISE BODY

The more you know about the way the body wo the better care you give it. Then healthful living longer "is too much trouble," "takes too much time,' "spoils the fun." Healthful living is one of the tools use to look your best and be your best.

You will want to ask yourself such questions as: W kind of person am I? What kind of person do I wan become? What can I do to make the most of mys What can I do to live best and serve most? How c eating the right food, breathing clean, fresh air, gett the right kind of exercise and enough rest help? V do I sometimes get angry? Is there anything I can about that? How do the body and the mind work gether? In what ways does the condition of one af the other?

WHEN CAN YOU GIVE ALL YOUR ATTENTION TO WHAT YOU ARE DOING INSTEAD OF TO THE WAY YOUR BODY IS WORKING?

THE KIND OF PERSON YOU REALLY ARE

How do you feel about yourself? What kind of person do you think you really are? Everyone is different. Here is what some other boys and girls your age think about themselves. Are the feelings of any of them somewhat like your own?

"I think I am just an ordinary person from a small country town. I am not too smart. I try to do my best but sometimes I don't succeed."

"I'm not any better than the next person, and I don't try to make people think I am."

"I think I'm the kind of person that most people can get along with. I do my best to be that way. I want other people to think I'm a friendly, honest person."

"I'm kind of noisy, like to have fun, and am not too fond of study."

"I'm pretty good in athletics. I like all kinds of sports. That helps me to get along with almost anyone. I want people to think I have a good sense of humor and can take a joke."

"I try to help people when they are in need of help. I like to have fun when the occasion arises. I also like to be serious and try to do my work as best I can."

"I believe I'm *aggressive**[1] and sometimes mean to my friends. I have a few friends but am not very popular. Many times I have said things that have hurt people, and I'm always sorry afterward. I try to be clean and neat. I wish people would like me for myself and not for other reasons."

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[1] Starred words are defined in the glossary at the end of this book. Many of the words you have already studied. See if you can define them. Then check yourself by looking in the glossary.

"I am full of fun and pep and act properly when I go out with boys. I may act a little snooty to a boy I don't like. I always speak to people that I know, young or old. I am friendly and easy to get along with, but I get jealous very easily over a certain boy."

"I think I'm over-*emotional.** Little things bother me. I try to be friendly and usually I am. I'm a little too easily persuaded to do things that might lead to trouble—just something for excitement. I take too many chances."

"I have a quick temper and get mad when people disagree with me. I get along with people who agree with me."

So many different personalities! So many problems in the way of becoming your best self—trouble in making friends, worry over school work, being over-emotional, losing one's temper!

On the other hand, we find many good things about ourselves. We build on these. Be sure to ask, "What are my good points?"

How does one "get this way"? Why is one young person "full of fun and pep"? And another "sick and tired"? What does your body have to do with the way you feel and act?

HOW YOUR BODY TAKES CARE OF YOU

Your body runs itself. It has its own *automatic** controls. Let us see how these controls work in keeping your body at about the same temperature, in all kinds of weather.

When you get a chance, take your temperature with the small *clinical** thermometer doctors always carry with them. Put the thermometer under your tongue and close your lips around it for three minutes. A healthy person's temperature is about 98.6°F. This is called the normal temperature of the body.

But a healthy person's temperature is not always exactly 98.6°F. It may swing from a low point of 97.3°F. at about 4 A.M. to a high of 99.1°F. at about 4 P.M. During the day, it may vary one or two degrees, more with young children.

During a fast game of tennis, the body temperature may go up three or four degrees. You'd expect it to go higher because a great deal of heat is produced during active exercise. But the body sees that this heat is carried away promptly.

A rise in body temperature without apparent reason is a danger signal. If certain germs get to work in the body, they will cause a rise in temperature. Then we say the person has a fever.

One's temperature may be lowered by *fatigue** and by the body being cold and wet. If you stay in cold water until you begin to shiver and become pale or blue with the cold, your body temperature may fall to 94°F. Then the white blood *corpuscles** that fight *bacteria** become less active. That gives the bacteria their chance to do harm.

The body has three chief ways of keeping its temperature the same day after day. Notice how each helps to keep you comfortable.

The first way is by changing the size of the *capillaries** in the skin. When you are hot, the capillaries grow larger. More blood is brought to the surface and cooled. When you are cold, the capillaries grow smaller. As a result, less blood is brought to the skin where it would be cooled quickly.

The second way is by *perspiring.** It takes heat to evaporate *perspiration.** The heat is taken from the skin. That is why you feel cooler after you have begun to perspire, especially on a clear, breezy day. That is also the reason why wet clothing feels so cold. The water in the clothing evaporates and withdraws heat from the skin, making you feel chilled.

On a clear, windy day the perspiration evaporates quickly and therefore takes heat away from the skin rapidly. On a still day when the *humidity* * is high, the perspiration evaporates slowly and little heat is withdrawn from the skin. A man shoveling coal into a furnace can stand a temperature of 200° or 250° F. for a short time if the air is dry, but he could not stand a much lower temperature if the humidity was high. In much the same way quick evaporation from nose, throat, and lungs helps to cool the body.

Clothing plays a part in regulating the body temperature. The body is continually giving off heat. Clothing holds a layer of warmed air close to the body and in the air spaces between or in clothing. Warmed air next to bare skin immediately rises and is replaced by cooler air. Several layers of lightweight clothing are warmer than a single layer of heavier clothing because a larger amount of warmed air is caught between the layers of clothing. A fur coat is warm because a great deal of air is held in the fur. The hair of a cat, rabbit, or sheep is light in weight. The bulk of the fur is about 98 per cent air.

Loss of heat is greatest from uncovered parts of the body where the blood comes near the surface. Gloves that fit well up over your wrists and socks over your ankles help to keep you warm and comfortable in cold weather. Woolen caps, scarves, and mittens help hold in heat during cold weather. The clothing of aviators flying at high altitudes is made to keep body heat from escaping.

Why do you shiver when you are cold? That is one way the body produces heat. Why do you feel hot when you get angry? That is the body's way of getting warmed up and ready to fight. One of the glands has given the body a shot of *adrenin.**

How do the *alcoholic* * beverages affect a person's temperature? Soon after *alcohol* * is taken into the stomach, the blood vessels of the skin begin to grow larger, as they do on a warm day. The skin accordingly tends to become pink and the person feels warm because the skin is warmed by the larger quantity of hot blood that is passing through it. But, if a clinical thermometer is used to measure the person's real temperature, a fall in temperature of from one quarter to one degree is found. This fall in temperature is caused by loss of heat from the enlarged capillaries in the skin. With large doses of alcohol the temperature may drop several degrees even though the person feels warm.

It is therefore dangerous to take alcoholic drinks as "warmers" before going out in the cold. Though feeling warm, the person is really wasting body heat. Severe chilling of the warm blood and a lowered *resistance** to colds and *pneumonia** may result. Many cases of freezing and frostbite are the result of the unfortunate use of alcohol as a "warmer." Most explorers who have had experience in the ice and snow and below-zero temperatures of the arctic or antarctic regions warn against the danger of taking alcoholic beverages to warm one.

Nor does alcohol make a good "cooler" in summer. Persons who use alcoholic drinks are more likely to suffer from heat exhaustion.

The three chief ways in which the body keeps itself warm whenever it becomes chilled are: (1) decreasing the size of the blood vessels in the skin, thus letting less blood come to the skin to be cooled; (2) secreting adrenin, which sets free fuel stored in the *tissues**; and (3) shivering, which increases heat production just as exercise does.

The body cools itself when it becomes overheated by (1) increasing the size of the blood vessels in the skin, and (2) the evaporation of perspiration from the skin and of water from the nose, throat, and lungs.

Keeping your body at about the same temperature all the time is only one example of the way your body runs itself. It is the *autonomic nervous system** that controls your breathing, the circulation of your blood, and your temperature. It takes no orders from you. When you do square dancing or play ball, you breathe faster and more deeply; your heart pumps more blood to your working muscles. When germs get inside you, the body quickly makes substances that will kill them or that will make them harmless.

Since the body does so much for itself, why are doctors needed? Much of the doctor's care is to help the body to heal itself. The well-trained physician, in time of sickness, helps you in at least four ways: (1) He makes a thorough examination to find out what is wrong. (2) He helps you to provide the conditions under which the body can repair itself most quickly and easily. (3) He thinks of the person as a whole. (4) He brings hope and good cheer to the sick person.

People who know little about health are usually the most ready to take any remedy they hear about. They pay large amounts of money to fake doctors for "cures" and *patent medicines** that are worthless or harmful. You can choose a good doctor by getting the names of several physicians from the medical society, a local hospital, the doctors' telephone exchange, or a social agency. From among these doctors with good training you can choose one to be your doctor.

A reliable doctor gives a *prescription** only after he has discovered the cause of the trouble. He is most of all interested in keeping people well. Anyone is smart to pay a doctor to help him keep in good health and steer clear of sickness.

PROBLEMS TO SOLVE

A wise man has said, "You can have facts without thinking, but you can't have thinking without facts." Our goal this year is to use facts in thinking about real-life problems. You have already learned problem-solving methods. This book gives you many facts you can use right away in solving important everyday problems.

1. How to gain understanding of yourself. What kind of person do you really think you are? What are your good points or strengths? What kinds of things do you do best? What do you like best? What kind of person do you want to become? Remember, this person you want to become is still *you*; it is not someone else you would like to resemble. Each of us can develop the best that is in us. There is much of good in everyone. We should look for it in ourselves and others.

Perhaps you need some outside opinion about your personality. A favorite teacher, a counselor, a clergyman, a Scout leader, or your parents can help you to look at yourself as you are and as you can become. Then the problem is to find out what you need to know and what you need to do. What health habits and choices will help? What ways of thinking and feeling? What ways of behaving toward friends and family? What changes can you help make in your home, school, or neighborhood to make it a better place for all children and young people to grow up?

This is a big order. But now is the time to do it, while you're changing and growing up.

WHAT IS YOUR SCORE?

Write on a sheet of paper these statements about regulating body temperature, completing each one as you think it should be completed. Each correct answer counts 5 points.

1. The normal temperature of the body is about (1) 98.6°, (2) 94.1°, (3) 100.0°.
2. A healthy person's temperature (1) remains the same, (2) varies a little.
3. When you are cold, the capillaries of the skin grow (1) larger, (2) smaller.
4. When humidity is high, perspiration evaporates (1) quickly, (2) slowly.
5. In cold weather it is more comfortable to wear (1) one layer of heavy clothing, (2) several layers of lighter clothing.
6. Alcoholic beverages make the temperature of a person exposed to the cold (1) higher, (2) lower.
7. In warm weather it is best to drink (1) more water than usual, (2) less water than usual, (3) more soft drinks.
8. The autonomic nervous system makes changes in your breathing, in the circulation of your blood, and in your temperature (1) without your telling it to, (2) at your command.
9. When you are hot, the capillaries of the skin grow (1) larger, (2) smaller.

[illegible] IS THIS GIRL PROTECTED FROM THE COLD?

WHAT YOUR BODY EXPECTS OF YOU

If all parts of your body are to do their complicated work, you must help. The blood cannot do its work if you do not eat foods containing iron and other *minerals.** Every part of the body needs rest in order to carry on its work.

You are helping your body do a good job of running itself if you can answer "yes" to these questions:

1. Have you had all cavities in your teeth filled?

2. Have you had your eyes examined and do you wear glasses if you need them?

3. Are you doing all you can to prevent and correct defects of teeth and eyes and other physical defects?

4. Are you doing all you can to prevent the spread of colds and other diseases? Do you wash your hands often, always before eating and after going to the toilet? Do you keep fingers and other objects out of your mouth and away from your face in general?

5. Do you take sun baths only ten minutes at first and never long enough to get badly sunburned?

6. Do you work or play out of doors and learn new sports and skills? Do you play fair and are you good-natured if you do not win?

7. Do you have your fun and do your work in the afternoon and early evening so you can go to bed between eight and nine o'clock every night?

8. Do you rest, drink water, and eat simple foods from the very beginning of a cold or other illness?

9. Are you eating the right kind and the right amount of food in the right way?

10. Are you careful to prevent accidents?

11. Do you know how to give first aid?

12. Do you plan a daily program for balanced living, with good amounts of work, play, and rest? The boy in the picture below regularly spends part of each day feeding the farm animals.

13. Do you get down to work promptly, keep your mind on what you are doing—don't let "your wits go woolgathering"—and make the best use of your time?

14. Do you meet each difficulty as it arises and do the best you can to overcome it?

15. Do you have a good attitude toward life and toward yourself? Are you cheerful, hopeful, and confident in the abilities you have?

16. Have you learned to enjoy and get along well with other persons?

Simple things to do, which you have heard about

before! But they will seem still more important when you learn more about the way in which your body works.

Good health, with the happiness and success it often brings, is not a matter of luck today. Good health should not be left to chance. It is a matter of knowing and taking care. It is largely the result of knowledge and of the application of this knowledge to proper habits of working and playing, eating and sleeping, thinking and feeling.

Some people drive an automobile without knowing anything about the engine that runs it. They just turn on electricity, shift gears, and steer. But a good driver usually knows something about the machinery and how it works. In the same way you will be more intelligent about the care of your body and make it run better if you know something about the way it is built and the way it works.

This year you are going to learn something more about anatomy and physiology. *Anatomy** tells you how the teeth, heart, lungs, eyes, and other parts of the body are built. The study of the way the parts of the body work is called *physiology**. The physiology of the heart tells what the heart does; for example, the heart pumps blood to all parts of the body. When you know more about anatomy and physiology, it is easier to see the reasons for following good health habits.

But why don't people always do the things they know are healthful? It must be because knowledge alone is not enough. Unless you use your knowledge, it does not bring health and physical fitness. Let us see what some junior high school pupils say about acting in healthful ways.

Betty says: "Going to bed early is one of the things I'm not very good about. I usually get into bed at about a quarter to nine, but then I get so interested in the book I'm reading that I stay awake until I have finished it or until my father comes by and sees a light shining under my door."

Jack says: "The reason why some boys and girls don't like to obey health rules is that it is fun to try out something that you have been told is bad. The two reasons why I like to stay up are that (1) once in a while I am not sleepy and (2) there are a lot of good programs on television on Monday night, Tuesday night, Wednesday night, Thursday night, Friday night, Saturday night, and especially Sunday night."

According to Don, "the reason why kids don't follow health rules may be that the rules have been forced upon them. When it's up to you, you take responsibility and do the sensible thing."

Jean says: "When I examine my health I note that the dubious pleasure of staying home from school with a cold is not so frequent as it used to be. Mother says that's because I am gradually building body resistance.

"Now I realize that knowing the proper foods to eat and eating them are two different things.

"So far this winter I have successfully avoided serious illness with the help of cod-liver oil, other *vitamins,** and plenty of sleep."

Jane wrote: "Rest is very important and my mother has always seen that I get plenty of it. Like most children, I hate to go to bed. I guess it's because of lots of good radio programs. A good book, too, is especially nice at bedtime. Maybe it is because I just don't feel like going to bed."

These junior high school pupils gave some common reasons for not doing things they know are healthful. One was the childish reason that they wanted to do anything that they were told not to do. Another reason was that they had been nagged about health rules until they were sick and tired of them. If they had been given responsibility for their own health, they would have been glad to do the sensible thing. One of the most common reasons was that doing the healthful thing sometimes interfered with something else they wanted to do. But you cannot go to sleep and listen to the radio, too. And getting enough rest and building resistance may help you to do something that is much more important to you than listening to a radio program.

There are still other reasons why people fail to do the things they know are healthful. Many older persons have got into the habit of eating certain foods, of treating illness in certain ways, of living in the same way their parents have lived, of doing what their neighbors do. They are "set in their ways." They keep on doing the unhealthful thing just because they have always done it. It is hard for them to change. For example, in one part of our country some parents were feeding their little children macaroni, boiled potatoes, pickles, tea, and coffee even when there was plenty of milk, eggs, liver, butter, green and yellow vegetables, and fruit.

There are persons, however, who do not have enough money to buy good food or land on which to raise it. There are persons for whom keeping clean and getting enough sleep are difficult. They do not do the things they know are healthful because it is hard for them to do them. They can, however, find ways of meeting their health needs. In every community the school, the church, and other groups will help them. "Where there's a will there's a way."

One boy who had been told by doctors that his *rheumatic fever* * was incurable taught himself to walk again.

He worked his way through college, where he studied agriculture. This boy, now Mr. D. Spencer Hatch, has been doing important work in Mexico.

He set up a model farm among the very poor Aztec Indians near Mexico City. There they were using *primitive** methods of farming, as in the picture below. He built a well-planned small house for himself, using material at hand. The house cost only sixty dollars. His plants and animals grew well.

The Indians who lived near by watched Mr. Hatch at work. Soon they came to ask questions. Then they began to try out his ideas themselves. He let them have seeds to plant and eggs to hatch, with the agreement that they would pay him back later. He gave away only his time and his ideas. He taught people to help themselves.

Through his quiet work, there are more and much better farms. New crops are being raised. Better livestock is being raised. Better houses are being built. The once poor Indian farmers are becoming healthier and happier.

Leaders from all parts of the Americas are going to Mr. Hatch's farm to learn his methods so that they may use them in their own countries. Thousands of poor farmers are learning to help themselves because of Mr. D. Spencer Hatch, who as a boy was thought to be too sick to live.

TEST YOURSELF

Read each of these statements carefully. Then copy each, using the word or group of words that makes the sentence true.

1. By "wisdom of the body" we mean that (1) the body needs good care, (2) the body takes care of itself in many ways, (3) a wise person should think about his body all the time.

2. *Physiology* is the study of (1) how the body is built (2) how the body works, (3) how to keep the body in good health.

3. Since the body does so much toward running and healing itself, (1) doctors are unnecessary, (2) you need not pay attention to good health habits, (3) you should make conditions as favorable as possible for the body to help itself.

4. The body is usually helped best to do its work by (1) medicine, (2) rest, (3) a few special kinds of food.

5. People don't always do the things they know are healthful because (1) they know too much about the way the body works, (2) they want to do something else at the same time, (3) they do not want to have health, strength, and vitality.

THINGS TO DO

1. Begin a diary or log of your growth and development this year. Include a graph of your height and weight. Put in the diary ideas that you want to remember and use. Write the correct answers to the tests at the end of each unit. Leave several blank pages after every unit for pictures and clippings you find on the subject in magazines or newspapers. And be sure to draw one full-page cartoon or comic strip on one idea in each unit that appeals to you most. Put it in a class exhibit with others before you add it to your own book. Talk over your diary with your teacher at least once a month.

2. Make a study of this question: "Why don't some persons that you know do the things they know are healthful?" Watch yourself and others and try to find an answer to this question.

3. It's easy enough to say, "Have a good attitude toward life and toward yourself," but what can you do when parents and teachers don't listen to you and seem unfair? Spend some time in class showing one another the best ways of handling such situations. This is called *role playing.*

INTERESTING BOOKS[1]

BRANDWEIN and others—*You and Your World,* pp. 63-67

HENRY—*Exploring Your Personality*

MEISTER, KEIRSTEAD, and SHOEMAKER—*The Wonder World of Science,* Book VII, pp. 311-335

MENNINGER—*Understanding Yourself*

PIERCE—*This Is the Life*

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[1] A complete list of references with the names of publishers will be found in the appendix.

DIGESTION AND TEETH

> "Man's ills, the experts say, *sans* question
> Are due to food and indigestion.
> If man eats food, or goes without it,
> Or soon or late, he'll hear about it.
> 'Tis much the teeth and duodenum,
> Have to answer for between 'em."
>
> *—Don Marquis*

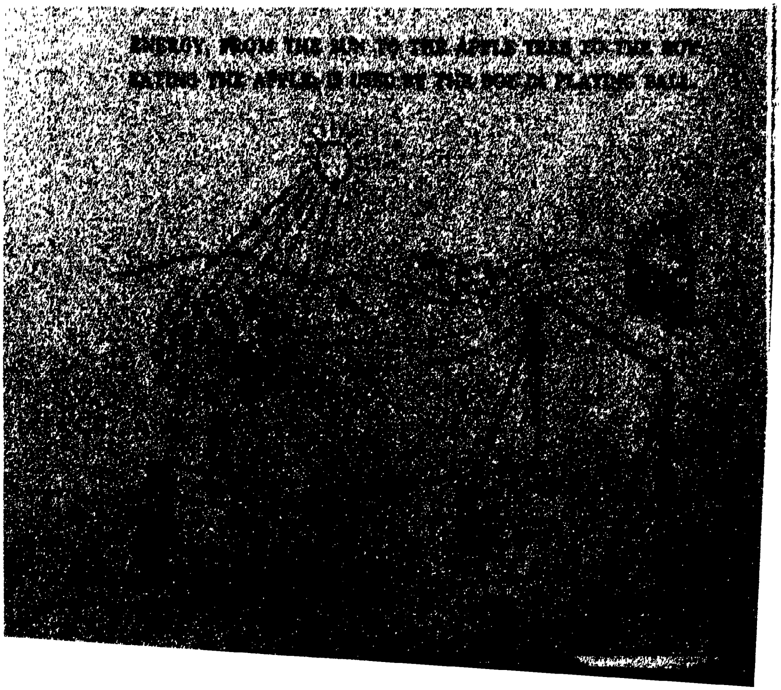
Good digestion and good teeth *do* make a differenc in the way we look and the way we feel. And how w feel affects digestion.

THE STORY OF DIGESTION

Why do we need food? How can the body change food into body cells?

As you know, we need food for energy and for growth. Food supplies energy for all your work and play, and it builds all the cells of your body. It is carried to the cells by the blood. The fruit, cereal, and milk you had for breakfast cannot get into the blood stream in the form in which you ate them. If you cut your finger, you would not find even the smallest piece of fruit or cereal or other food in the blood. Why not? The food must have been changed to other forms. This changing of food in the body is called *digestion.*

Plants store energy from the sun in their cells. Their cells supply food for animals and man. When food is eaten and digested, it can be stored in our cells. There



ENERGY, FROM THE SUN TO THE APPLE TREE TO THE BOY EATING THE APPLE, IS USED BY THE BOY IN PLAYING BALL its energy is freed for use whenever the body needs it.

The story of digestion begins when we take our first bite of food. The story ends with the building of cells, the storing of energy, and the *elimination* * of waste products. You will see how the food you eat is chewed, changed, and dissolved so that it can build blood, muscles, and bones, and supply energy. You will learn how you can help make the best possible use of food.

You may have some questions to ask about digestion and eating habits. Other students have asked the following questions:

Why must food be digested? What are digestive juices good for? What are the organs of digestion? How long is the *alimentary canal**?

How long does it take food to digest?

Are some foods *indigestible**? Why do some foods disagree with certain people?

In what ways are bacteria that cause disease prevented from being taken into the body with food?

Is good digestion necessary for a good *complexion**?

Will eating fast cause *indigestion**? How much time should one spend in eating meals? Is it wise to get up from the table feeling hungry?

What harm may eating between meals do?

What can a person do to aid digestion?

You will find the answers to these questions in this story of the way the foods you eat are changed so that they can be used by the cells in all parts of the body.

THE WORK OF THE ALIMENTARY CANAL

Imagine you are a piece of bread about to take a trip through someone's alimentary canal. As you enter the mouth, you'll get soaked with *saliva* * and ground up at the same time. Your starchy cells begin to break down

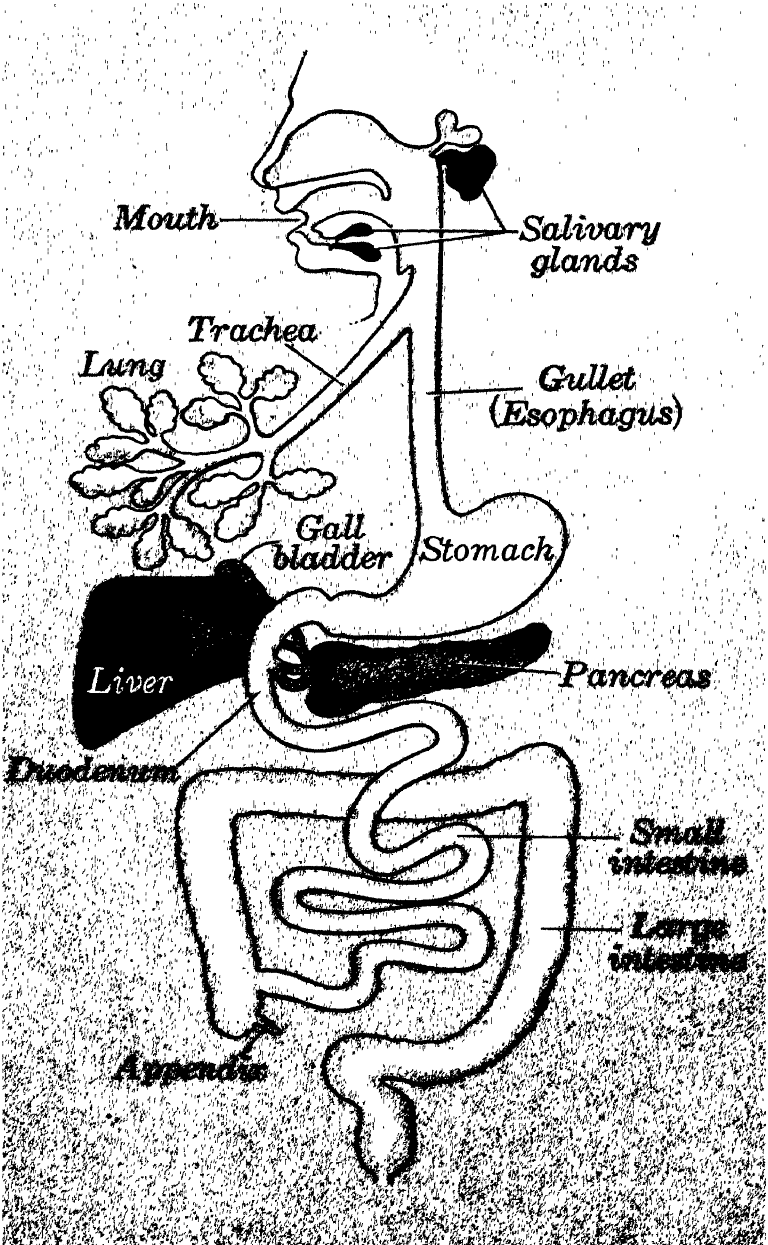
a little. Now you're about to be swallowed and go skidding down the long tube that people call an *esophagus.** You land in the stomach. There you have a rough time and are shoved back and forth. The saliva that was mixed up with you in the mouth keeps on breaking down your starch cells into sugar. As soon as you're liquid enough, you're squirted through a little trap door into the gateway to the small *intestine.** This gateway is the *duodenum.** From its walls drip more digestive juices. These will dissolve you and change you still more. One of these juices comes from the *pancreas;* * one comes from the *liver* * as *bile.**

Now you are ready for your bumpy twenty-foot trip through the winding passage that is the small intestine. More digestive juice pours on you and you move by starts and stops. As soon as any part of you is completely changed—that is, thoroughly digested—you pass through the walls of the intestine into the blood stream.

The part of the food that cannot be completely digested goes into the large intestine. That is the last part of your journey. You'll move right along if this person has been drinking plenty of water and eating fruits and vegetables that leave an undigested part.

This is, in brief, the journey food takes. Digestion takes place in the alimentary canal, a tube about thirty feet long. You can trace the journey of a piece of bread through the alimentary canal in the diagram on page 26. Find the organs of digestion all along the way—*mouth, tongue, salivary* * glands, *teeth, gullet,** or *esophagus, stomach, small intestine, large intestine, pancreas, liver, gall bladder.** Which of these names are new to you? Now that you have a snapshot of digestion, you are ready to fit in more scientific details.

You are very familiar with digestion in the mouth.



THE DIGESTIVE SYSTEM AND LUNGS

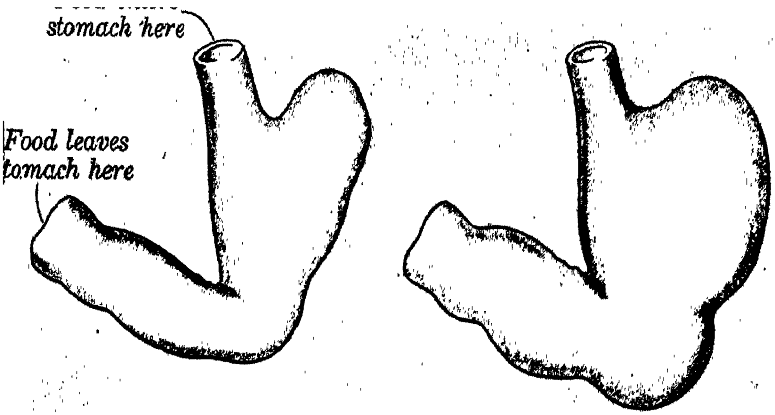
You know what happens there. When you smell baked beans or apple pie, your mouth "waters." The digestive juice of the mouth—the saliva—begins to flow from little glands in your cheeks and under your tongue. These little glands manufacture saliva. They store it until it is needed. They pour it into the mouth when there is a call for it. In what ways might you interfere with digestion in the mouth?

The slimy saliva makes the food slippery so that it can be swallowed easily. It *dilutes* * *concentrated* * foods. For example, a chocolate cream is a concentrated food. Mixing it with saliva makes it more watery and less sweet in proportion to bulk. Saliva also begins to change the starch in foods. The blood does not carry starch, but it carries a certain kind of sugar. Starch can be changed to sugar. For example, starch is changed to sugar when corn sirup is made from corn. In digestion the starch you eat is changed to a certain kind of sugar, *glucose,** which is easily *soluble* * in water. This digestive change from starch to sugar begins in the mouth through the action of saliva.

What part do the teeth play? They of course grind the food into small pieces. The teeth and the tongue and the cheeks all help to mix the food with saliva as you chew. Do you chew mashed potatoes and other soft foods? Many people do not think chewing is necessary unless the food is hard or tough. As a matter of fact, it is quite important that saliva be mixed well with soft and starchy foods if digestion is to be aided.

When the food has been ground fine and well mixed with saliva, it is ready to be swallowed. It is pushed down by the muscular walls of the gullet and enters the stomach.

The stomach, as you can see in the picture on page 28,



THE HUMAN STOMACH, EMPTY AND FULL

is a muscular bag. The average stomach of an adult can hold about three and a half pints. The stomach stores the food you eat in a meal and continues quietly to digest this food for you while you are busy with many other things.

What happens to the food in the stomach? The process of making it soluble continues in much the same way as in the mouth. The stomach has no teeth; so it cannot grind the food into smaller pieces. But it has strong muscular walls that help to mix the food thoroughly with its digestive juices. The stomach muscles *contract* * and *relax,** contract and relax, pushing the food in the stomach back and forth.

From glands in the muscular walls another digestive juice, known as the *gastric * juice,* is poured into the stomach, just as the saliva is poured into the mouth. The gastric juice is acid. It has a sour taste. If you have been seasick or "sick at your stomach"—*nauseated,** the doctor would say—and have vomited (thrown up) some of the contents of the stomach, you may have noticed how sour they tasted. The gastric juice has two main uses: (1) to kill some of the bacteria that may have been on the food and (2) to begin changing some of the proteins to a soluble form.

As you have already learned, many people work to keep food clean and as free from harmful bacteria as possible. The dairyman and the farmer guard milk and other food from bacteria. The people who work in food factories, the men who enforce the pure food laws, and the storekeeper, all help to keep food safe and clean. In your home fruits and vegetables are washed. Food that spoils easily is kept in a very clean, cold refrigerator, for bacteria, you remember, grow more rapidly in warm places. Before you begin to eat, you wash your hands. Can you tell of other ways to prevent bacteria from entering the body in food?

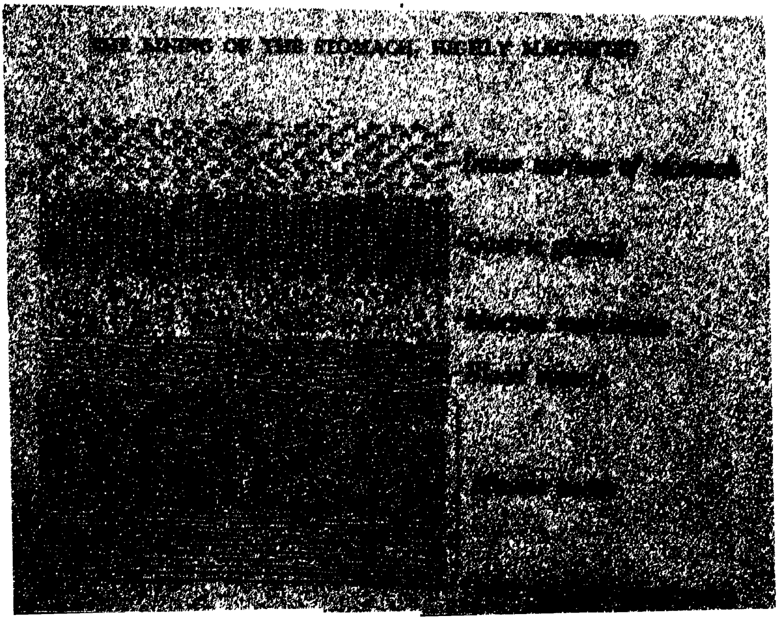
But in spite of carefulness and cleanliness bacteria may enter the body in food. Some of these bacteria do no harm, but some of them may be the dangerous kinds that cause certain diseases. If the gastric juice kills the harmful bacteria, there is no trouble. But if the juice does not succeed in killing the dangerous bacteria, other defenses of the body start to do their part in preventing sickness.

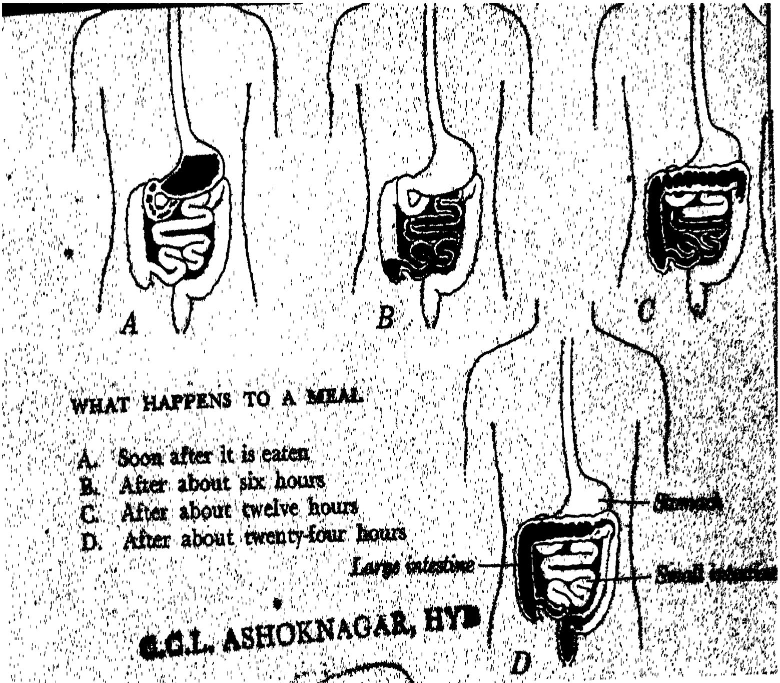
What has happened to the saliva that was mixed with the food when you chewed it so thoroughly? The saliva had only a few moments to change starch in the mouth. But in the stomach, if the food has been well chewed, the saliva may continue to work for a half hour, sometimes longer. The more finely the food has been chewed, the more easily can the saliva act on it. When the acid gastric juice becomes mixed with the starch, the salivary digestion stops. Saliva cannot do its work when the food is even slightly acid.

When the food is in a much more liquid state than it was when you swallowed it, it passes out of the stomach into the part of the small intestine called the duodenum.

An average meal may take from five to seven hours to leave the stomach. Why should you ordinarily feel more hungry for breakfast than for lunch? The length of time food stays in the stomach depends a good deal upon the kind of food that is eaten. Proteins and fats together, such as pork, fat sausage, or mince pie, stay in the stomach longer than any other foods.

In the small intestine the process of changing food so that it can be *absorbed* * by the blood is mostly completed. Three digestive juices help in changing the food into a form which the cells can use. One digestive juice is the bile. The bile acts on fats. It helps to change them into soluble form. Perhaps you have heard people say they were "bilious" when they had headaches and *nausea.** There is no such thing as *biliousness* * due to excessive flow of bile, although some foods cause more bile to flow than others. A meal of meat causes a large flow of bile; a meal of *carbohydrates* * causes a small flow.





WHAT HAPPENS TO A MEAL

A. Soon after it is eaten
B. After about six hours
C. After about twelve hours
D. After about twenty-four hours

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There may be, however, true biliousness due to obstruction in the flow of bile. What people call "biliousness" has often been found to be caused by infected food, unwise choice of food, painful eyestrain, nose and ear *infections,** or *foci of infection* * in various parts of the body. The boy who smokes his first cigar has all the *symptoms* * of what is miscalled "biliousness."

A second digestive juice comes from the pancreas, a large gland that is just behind the stomach. The pancreas of certain animals is used as food. It is called *sweetbread.** The digestive juice from the pancreas is called the *pancreatic* * juice. The pancreatic juice acts on fats, carbohydrates, and proteins.

A third digestive juice comes from glands in the walls of the small intestine, just as the saliva comes from glands in the mouth and the gastric juice from glands in the stomach. This digestive fluid is called the *intestinal juice.* It completes the changes that must be made in proteins before they can be absorbed into the blood stream.

These three digestive juices help one another to do their special work better. They finish the work of digestion that was begun by the saliva in the mouth and continued by the gastric juice in the stomach.

The food is pushed along the small intestine by the *contractions* * of rings of smooth muscle in the inside of the intestinal wall. It is somewhat like squeezing tooth paste out of a tube. All the smooth muscle in the alimentary canal is under the control of the autonomic nervous system. You never have to think, "Now I'll start the contractions in my stomach and intestines." The autonomic nervous system and the smooth muscles take care of them for you. The autonomic nervous system also controls the *secretion* * of the digestive juices.

Disease, fatigue, and infection affect all parts of the body, including the nervous system. That is why fatigue and weakness may lead to poor muscle tone and poor secretion of the digestive glands. These conditions cause poor digestion.

When some of the food has been changed into the soluble forms in which the body uses it, it is seized by the cells of the lining of the small intestine and passes through them and through the very thin walls of the capillaries. Thus the food we eat gets into the blood stream and is carried to the liver. There some of it that is not needed at the time is changed and stored until the cells in the body require it.

Some parts of food, such as the *fibrous* * parts of fruits and vegetables, cannot be dissolved by any digestive juice. The pictures on page 31 show how long a time passes after a meal has been eaten before the undigested food, the leftover digestive juices, and the bodies of bacteria pass on into the large intestine. It is at least a day or a day and a half before food eaten in one meal has completed its journey through the alimentary canal. The journey may take longer than this.

Great differences are found in the structure of the large intestines of different animals. These differences are due to the kinds of food eaten. In wolves, lions, and other meat-eating animals the large intestine is relatively short and narrow. In cows, sheep, and other grass-eating animals the large intestine is much longer and wider. Man eats both meat and green leaves. His large intestine is built to take care of a mixed diet. It is longer than the intestine of meat-eating animals and shorter than that of grass-eating animals.

// The part of foods that is not digested never reaches the cells. It cannot get through the walls of the small intestine. When this waste material begins to fill up parts of the large intestine, it presses against the muscular walls. This pressure is the signal for certain of the muscles to contract. The contractions pass in waves up and down the large intestine. They gradually carry the waste toward the end of the large intestine. Finally there is a feeling of fullness which serves as a signal for a bowel movement. If you do not go to the toilet and have a bowel movement when this signal is given, the desire passes away for a time.

Bacteria of many kinds grow well in the warm, relatively quiet large intestine. Some of the bacteria may break down meat and vegetable fibers that the digestive juices could not break down, while others may cause decay or excessive *putrefaction* * in the food. It is important to have regular bowel movements.//

YOUR RESPONSIBILITY FOR GOOD DIGESTION

Having followed food through the alimentary canal, you have discovered many ways in which you can aid digestion. Write all you think of in your health diary before you read the next pages.

It pays to work up a good appetite. The Scout in the picture has walked many miles and is ready for lunch. He is hungry! What makes you feel hungry when your regular mealtime comes around? *Physiologists* *—scientists who study about the way the body works—say that real hunger is due to the contractions of the muscles of the empty or almost empty stomach. Every time there is a contraction, you feel the *sensation* * of hunger. Your stomach is telling you in its own way that it is ready for food. Sometimes you are not really hungry but have an appetite at mealtime because you are used to eating at that time. Appetite seems to be merely a habit, but being hungry shows that the stomach is expecting food.

But suppose that you feel hungry before mealtime. Should you wait until your regular mealtime? It is usually best to do so. If you eat between meals, you will not enjoy your regular meal so much. If you have had a light lunch and feel hungry when you come home from school, a glass of orange juice or an apple will take away the hungry feeling. These foods will not interfere with your appetite for the next meal because they pass out of the stomach in an hour or two. They will "stay your stomach" until your regular mealtime. "Stay your stomach" is an old-fashioned expression that describes what physiologists say happens when you satisfy hunger. You "stay your stomach" by stopping the contractions of the empty or almost empty stomach that are causing the sensations, or feelings, of hunger. Water alone relieves hunger, but for only a very short time because it passes from the stomach into the small intestine in a few minutes.

Even the thought of food sometimes "makes your mouth water." Seeing and smelling food also start saliva flowing. When you begin to chew the food and get its delicious flavor, the salivary glands pour still more of their secretion into the mouth. Seeing and smelling food make some people's "stomachs water," too. Eating food that looks and tastes good, if hunger and appetite are present, starts the flow of gastric juice in the stomach. Pleasant eating also increases muscular tone—that is, pleasant eating makes the muscles ready to contract vigorously.

In these ways the mouth and stomach become ready to receive the food as soon as it reaches them. Serving at regular mealtimes food that smells good, looks good, and tastes good is one way of aiding digestion. It is like getting a good start in a race.

"Chew your food well" is good advice. The only chance you have to chew food is when it is in the mouth. When the food is chewed into small pieces, all the digestive juices can reach it more quickly. Chewing, you know, is the first step in changing food to a soluble form. What happens, on the other hand, when you eat too fast? It is a good plan to set aside at least twenty minutes for every meal. It is a good plan to include some hard food such as crisp toast or raw carrot, cabbage, or celery in every meal. You cannot forget to chew these foods.

Have you ever noticed the difference between chewing hot breads, such as soft biscuits and muffins, and crisp, crusty, or dry bread? The hot breads roll themselves into doughy balls. You try to chew them. They do not mix well with saliva. The crisp breads, on the other hand, crunch into very small pieces and almost "melt in your mouth." The saliva begins to change the starch into soluble form quickly.

You can have too much of any good thing—for example, gastric juice. Too much acid in the stomach may become irritating to the *mucous membrane.** Perhaps you have had a "sour stomach"—*"hyperacidity"* * the doctors call it. In cases of hyperacidity doctors recommend very mild-flavored foods, such as milk, bread, baked potatoes, and bananas. *Acidosis* * is often confused with hyperacidity of the stomach. Acidosis is an excess of acid in cells all over the body. Hyperacidity is an excess of acid in the stomach. Fruit acids, such as those in oranges, grapefruit, and apples, do not cause an excess of acid in the body cells. Indeed fruits and vegetables help to prevent acidosis.

Now decide together the physiological reasons for the following eating habits:

1. *Be cheerful at mealtime.*

2. *Do not talk with food in your mouth.* What happens when a piece of food falls down the *windpipe**—the passageway leading to the lungs?

3. *Eat a comfortable amount of food at one time.* Don't stuff yourself. Your stomach may change with the size of meals you regularly eat. An over-stretched stomach leads to more overeating.

4. *Avoid harmful or irritating substances in food.* Certain *chemicals,** such as *benzoate of soda,** *sulphur dioxide,** and *sodium sulphite,** are sometimes put in food so that it will keep better. These substances preserve food by poisoning the body stuff, the *protoplasm,** of bacteria. The protoplasm of bacteria is similar to the protoplasm of the cells of our bodies. If frequently used, food preserved by these chemicals may be harmful to health. Other substances that might irritate the soft mucous membrane lining the mouth, throat, and stomach are concentrated sweets, that is, very sweet things; spices; acids; coarse, scratchy bran; and overheated fat.

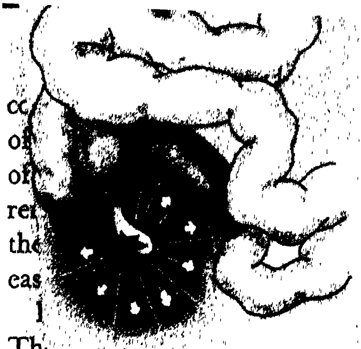
Alcohol is another substance that may irritate the mucous lining of the stomach. Physiology books for school children fifty years ago contained pictures of the inside of a drunkard's stomach, showing it to be extremely red and *inflamed.** These pictures were made to show that concentrated solutions of alcohol are irritating to the lining of the stomach.

William Beaumont, a young army doctor, had a chance to look into the stomach of a patient and see what went on there. The patient had been accidentally wounded in the stomach by a gun. The wound left an opening in the *abdomen* * and in the stomach wall somewhat like an open window, through which Dr. Beaumont could see the movements and processes going on. He could watch the contraction of the stomach muscles. He could actually see the gastric juice oozing out from the glands of the stomach. He noticed that alcohol did make the lining of the stomach red and inflamed, and he found that "persistent use of alcohol produces disease of the stomach."

// Since the alcoholic beverages make people forget worry and anxiety for a short time and since wines have also been shown to increase the flow of saliva and gastric juice and give a sense of warmth in the stomach, wines have sometimes been recommended as a tonic to improve appetite and aid digestion. It has been proved, however, that the direct action of all the stronger alcoholic beverages upon the digestive juices of the stomach and pancreas is to slow down their secretion.

Thus even small doses of alcohol, if taken in concentrated form, may, in some persons, definitely interfere with the digestion of food rather than aid it. Large doses of alcohol seriously interfere with digestion, often leading to the excessive secretion of *mucus* * and the *inflammation* * of the mucous membrane of the stomach, with nausea and vomiting as the result//

5. *Don't go to extremes to avoid constipation.** There is a happy medium between eating little fruit, vegetables, and whole grains and stuffing yourself with these foods. Some people, when they learn that such foods as fruits and vegetables and bran help to prevent constipation, immediately begin to eat huge quantities of them. But these coarse foods should not be eaten in amounts that are irritating to the digestive tract. In a few cases



RUPTURED* APPENDIX* white spots represent in- pus* escaping from the in-

The appendix joins the large intestine near the place where the small intestine opens into the large intestine.

it may be wiser to eat foods that have few fibers. A doctor can prescribe a helpful diet or sometimes a cathartic.

Such fruits as apples, oranges, and grapefruit contain an acid that has a mildly *laxative** effect. Prunes, figs, and dates supply both fibers and a chemical *stimulus** to a bowel movement. Some people find that if they eat four or five prunes or dates or two or three figs at breakfast they have no trouble with constipation.

Many people find that drinking a glass or two of water before breakfast is an aid to a bowel movement. They get up early; drink a glass of water; eat an orange, some grapefruit, or other fruit; do some work. After an hour or so they have a bowel movement and are ready for a good breakfast.

In the case of pain in the abdomen, cathartics should never be given without the doctor's orders because the pain may be caused by *appendicitis** or some other condition that the cathartic may make worse. More than two thousand years ago a famous Greek doctor wrote, "A purging medicine (strong cathartic) must not be used

without great advice and judgment." This statem
as true today as it was when it was written.

The appendix is a small part of the alimentar
that often makes trouble. It is a narrow tube
very near the point where the small intestine jo
large intestine, or *colon.** You can find it in the
on page 26. Sometimes bacteria gather in the a
and cause inflammation and swelling. Pus m
The abdomen becomes painful and may feel h
person may have fever and nausea. Of course e
in the abdomen does not mean appendicitis, b
be a sign of appendicitis.

If the person foolishly decides to "doctor himself" and take a cathartic, he may cause serious trouble. The cathartic *stimulates* * the wavelike motion of the intestines and is likely to cause the inflamed appendix to rupture, or burst. A ruptured appendix is serious. The bacteria and pus, instead of being held inside the appendix, escape and spread the infection. Someone has said that to take a cathartic for a pain in the abdomen is like throwing gasoline on a fire. The infected appendix may also burst if it is not removed soon enough.

When a person feels nauseated and has pain in the abdomen, it is wiser for him to rest quietly and not to eat anything. Eating stimulates the digestive system and is likely to increase the nausea. If the pain does not pass away within a few hours—many doctors say within about four hours—a doctor should be called. In case of severe pain, you should not wait so long.

The doctor makes an examination and will probably take a drop or two of blood from the person's finger. He counts the cells in this blood under his *microscope.** Whenever there is infection, the white blood corpuscles begin to increase rapidly in number. These white blood corpuscles attack bacteria. An unusually large number of these white blood corpuscles and certain other signs of illness tell the doctor that the appendix needs to be removed. If the appendix is removed before it bursts, the person will usually recover much more quickly and easily.

Regularity is important in preventing constipation. The large intestine can be trained to get rid of some of its contents at regular times. Many people find that just before or after breakfast is a good time to go to the toilet. If you were going camping Saturday and set an alarm clock to waken you in the morning, you would get up when you heard it ring. The "call" to a bowel movement should be heeded in a similar way. If you pay no attention to the call, the distended, or stretched, muscle that starts the message to your brain may in time fail to give the signal. It is a good habit to heed the signal at a convenient and regular time each day. //

Millions of dollars are spent in the United States each year for laxative medicines. Doctors say that many of these medicines are unnecessary or may be harmful. The habit of taking laxatives does not "cure" constipation but often makes it worse. The digestive tract is not allowed to act in its natural way. If a person takes pills, salts, or other laxatives day after day, the muscles of the intestines become sluggish from lack of natural exercise and regularity. Larger or stronger doses must be taken. These may interfere with the digestion and *absorption* * of food substances. Some expensive reducing medicines are really cheap cathartics that prevent food from being absorbed or stored in the body.

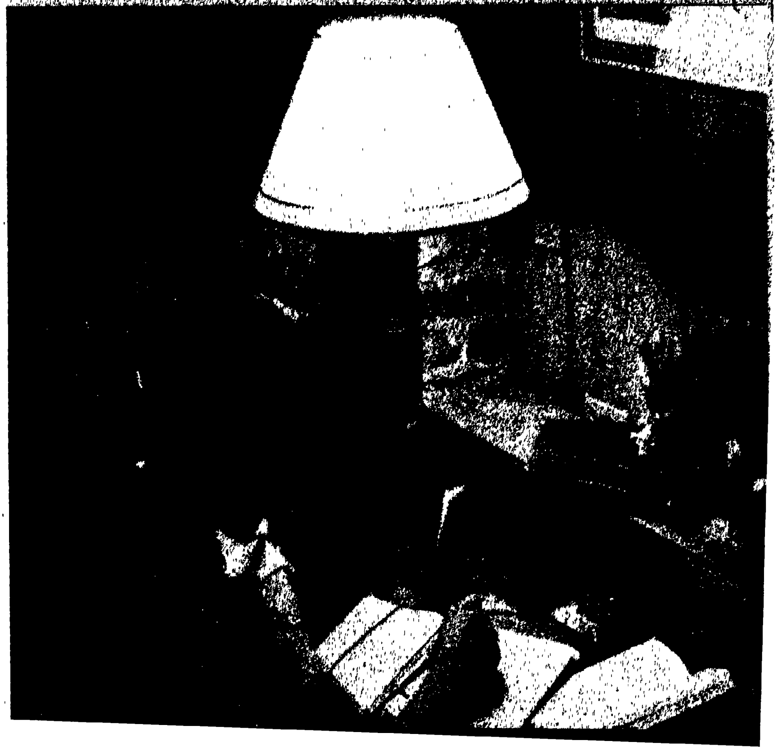
Constipation often makes a person feel dull and uncomfortable. Many people have the idea that this is because some "poison" is absorbed from the waste material in the large intestine. They think of the large intestine as a kind of sewer that must be flushed out. Doctors nowadays believe that, except in very severe cases, not many *toxins* * are absorbed through the walls of a normal large intestine. The waste material should not remain too long, of course.

Advertisers of laxative medicines often play up the bad effects of constipation. Read some of these advertisements in your newspaper and in magazines. Listen to what is said over the radio. TV programs also urge you to buy pills, salts, and remedies of various kinds. Some advertisements play upon fear. Others promise beauty, popularity, or a good job. Some say their medicine should be taken in fruit juice or followed by a glass of water. How does what you read in advertisements and hear over the radio agree with what you have learned in this unit? What wrong ideas have you got from the makers of laxatives?

¶ Some people become very much worried and upset if they miss a bowel movement, although many doctors say that to miss a movement once in a while is not a cause for worry. Immediately these people begin to take medicines. They pay attention to only one thing instead of watching their diet and following regular health habits. In some cases worry delays digestion and affects the muscles of the intestines. Plenty of fruits and vegetables, enough water, sufficient exercise, regular habits, and cheerfulness are better than laxative medicines. They improve your health and are good ways of gaining the clear skin, popularity, and pleasure of work and play that some advertisers promise. On which would you prefer to spend money, time, and effort for health—good health habits or doses of highly advertised medicines? /

There are cases when the doctor will advise a cathartic. Using a cathartic under the doctor's direction is different from doctoring yourself by taking pills or salts. There may be some special cause for constipation. That is something which the doctor will find by making an examination or by certain tests.

6. *Keep in good general health.* All parts of the body work together. Many things beside good food aid digestion. A change from poor to good *posture* * has been found, in some cases, to cure constipation and to have a good effect upon digestion. Painful eyestrain may affect digestion. Digestive disturbances have sometimes been traced to lung trouble. One woman was suffering from so-called indigestion so severely that she could not eat



WHY IS THIS LAMP POORLY PLACED?

the simplest meals. The cause proved to be a neighbor's loud radio that was going day and night and perhaps "got on her nerves." When this woman moved to a quieter place, her indigestion disappeared. Men who are worried about business often suffer from indigestion. They may work hard and take little time for meals. Perhaps they eat poorly balanced meals and have little exercise. When business improves, the indigestion may be forgotten. Worry, anxiety, fear, or grief is often the chief cause of indigestion and heart trouble. "Keep smiling" is a good prescription.

Almost anything affecting harmfully any part of the body may interfere with digestion. It might make any food indigestible, that is, hard to digest. Keeping in good general health therefore aids digestion.

THINGS TO DO

1. Look through the evening paper every night. Read the health column if there is one and any other articles about healthful living. Write in your health diary or log the points you especially wish to remember. Discuss these in class when opportunity offers. Make a note also of words that you do not know. Write these words in the sentences in which they were used. Look up the words in a dictionary. If their meaning is not yet clear, ask your teacher to explain them in class some day. Learning these new words is an important part of this year's work. A clear understanding of the new words will help you to read intelligently most health articles in newspapers and magazines.

2. Collect advertisements of patent medicines that claim to aid digestion. Discuss the claims. Ask a doctor to talk to your class about such medicines.

3. Chew a good-sized piece of bread for two minutes. What changes have taken place in the bread?

1. Look at the picture on page 43. What is wrong with the lighting here? How could this young man change the lighting so that a good bright light would fall on his book but not in his eyes? Why would a floor lamp be better?

2. *How to handle situations at mealtime that might interfere with digestion.*

"My little brother always says something that makes me angry, and Mom and Dad take sides with him every time."

"I should have told Mom I broke her mirror, but instead I worried about it all during dinner. I could hardly eat anything."

"Dad told me I couldn't go skating tonight. That made me mad. All the crowd are going."

In handling these and other similar situations, the first step is to try to find the cause. For example, why does your brother's teasing make you angry? Why can't you see the funny side of it?

Having gained an understanding of the situation, you will see it in a different light and feel differently about it. You will also see more clearly what are some of the things you can do about it. You may find that you are annoyed by what your brother does because you feel that your parents like him more than they like you. Well, many parents do seem to neglect the older child when a new baby comes. But does your quarreling help your relation with your parents? Suppose you tried finding something you could really enjoy doing with your little brother. In time, you might feel pleased to have a little brother who was proud of you and thought you were just "tops."

3. *How to be scientific in choosing lunch.* First recall the different kinds of food you need daily:

THE "BASIC SEVEN"	THEIR SPECIAL FOOD VALUES
1. Milk and milk products, cheese, evaporated milk, dried milk 1 pint to 1 quart 5 tablespoons dried whole milk = 1 cup milk ½ cup evaporated milk = 1 cup milk	Rich in protein, *calcium*,* *phosphorus* * A good source of vitamin A A fair source of *thiamin* * (vitamin B_1), and *riboflavin* * (vitamin B_2) A small amount of iron One cup of whole milk yields about 150 *calories*.*
2. Oranges, grapefruit, tomatoes; or raw salad or salad greens Strawberries, cantaloupe, green peppers, pineapple, cherries, raspberries 1 serving	Rich in vitamin C, or *ascorbic acid*.* This is their most important food value.
3. Green and yellow vegetables, vegetables with dark green leaves, such as kale, chard, turnip greens, water cress, spinach; turnips, mustard, and collard greens, beans Some raw, some cooked or canned	Important sources of vitamin A Rich in iron Good source of calcium, thiamin (vitamin B_1), riboflavin (vitamin B_2), *niacin* *
4. White potatoes	A low-cost energy food A good source of ascorbic acid, iron, niacin, and thiamin

THE "BASIC SEVEN"	THEIR SPECIAL FOOD VALUES
Sweet potatoes	Rich in vitamin A
Other vegetables and fruits; raw, cooked, or canned	Some iron, thiamin, riboflavin, and niacin
Yellow fruits	Supply vitamin A
Dried fruits	Good source of iron
1 or 2 servings of potatoes 2 servings of other vegetables and fruits	
Meat, poultry, or dried beans, peas, or nuts, or peanut butter	Rich in protein, iron, phosphorus, thiamin, niacin, and riboflavin
Liver, eggs	Rich in vitamin A and vitamin D
Sea foods: herring, mackerel, salmon, sardines	Supply iodine, vitamin D, protein, niacin
1 serving; an egg a day or at least 3 or 4 eggs a week	
6. Natural whole-grain or enriched or restored bread and cereal	Low-cost energy foods Important sources of iron, thiamin, and niacin Good sources of protein and riboflavin
At each meal	
7. Butter or fortified margarine	Concentrated energy foods Excellent source of vitamin A
At each meal	

Food values are highest when vegetables and fruits are used as soon as picked and when they are served raw or have been cooked in their skins, only until tender, in small amounts of water.

If you choose properly from the many foods in these seven groups, you will get the calories you need. Boys and girls of your age, you know, need about 2400 calories a day. The exact proportions and amounts of calories vary for different people and for the kinds of work they do. Running or playing hard burns up more energy than sitting quietly. In cold weather you need more fats to keep you warm than in summer. You need each day about 70 to 90 *grams** of protein, 1.0 to 1.4 grams of calcium, and .012 to .015 gram of iron. If you look at the left-hand column on page 49, you will find the word *apple*. If you read across the page, you will see that one small apple supplies 63 calories; 0.4 gram of protein; .007 gram of calcium, .00036 gram of iron, and vitamins C and B_1. You do not need to learn these tables of course. You use them when you want to find out about any food.

As you look at the list of foods on pages 49-51, you will notice that you need much less of certain foods to get your calories than of other foods. Most boys and girls like popcorn. But would you want to eat over 55 cups of popcorn to get a day's calories? Perhaps it is well that we like butter on popcorn, because butter is high in energy value. If you ate pecans instead of popcorn, you would have to eat over 3 cups to supply the calories you need. But how well would this day's diet be balanced?

Now you are ready to apply some of these facts to your daily meals. If there is a *cafeteria* * in your school, help your class to print on white cards the number of calories in each food served in the cafeteria. Get a book about calories to help you find the fuel value of some of the foods. Put these cards in the cafeteria so that everyone can see the number of calories he is choosing.

Make posters showing the chief food *elements* * served in the cafeteria. Put these posters back of the foods. For example, a poster back of the raw fruit and vegetable salads would have these food elements listed: iron, calcium, phosphorus, vitamin A, vitamin B_1 (thiamin), vitamin B_2 (riboflavin) vitamin C (ascorbic acid).

FOOD VALUES[1]

FOOD	MEASURE[2]	CALORIES	PROTEIN, GRAMS	CALCIUM, GRAMS	IRON, GRAMS	VITAMINS, BEST SOURCES OF:
Apple, fresh	1 small, 2" diameter	63	0.4	.007	.00036	C, B_1
Applesauce	⅜ cup	157	0.2	.005	.0002	......
Apricots, dried	½ cup, packed	278	4.7	.065	.0076	B_1, G, A
Asparagus, fresh	12 stalks, 5" long	26	2.2	.021	.001	C, B_1, G
Bacon, broiled	30–35 small slices	517	16.7	.013	.0035	G
Banana(s)	1, 6½" long; or ¾ cup sliced	99	1.2	.008	.00064	C, B_1
Beans, baked	½ cup	129	6.9	.062	.002	B_1
Beef, lean muscle	7 thin slices, 4" x 5"	156	21.3	.013	.003	B_1, B_2, G
Beet(s), cooked	2, 2" diameter; or ½ cup diced	40	2.3	.024	.00085	B_1, G
Bologna	1 piece, 2⅛" diameter, 1⅛" thick	234	18.7	.003	.0028	......
Bread, white[3]	4–5 slices	261	9.2	.05	.0008	B_1, G
Bread, whole-wheat	4–5 slices	245	9.7	.05	.002	*B_1*,[4] G
Butter	½ cup, scant; or 10 squares, 1¼"x1¼"x¼"	733	1.0	.016	.0002	*A*
Buttermilk	½ cup, scant	33	3.3	.105	.003	......
Cabbage	1½ cups, chopped, raw	29	1.4	.046	.00043	C, B_1
Cake, plain	2½" x 2½" x 1¾"	199	3.7			......
Carrots	¾ cup, ½" cubes	45	1.2	.042	.00103	*A*, B_1, C
Celery stalks	¾ cup, ¼" pieces; or 4 medium stalks	22	1.3	.072	.00062	B_1, C
Chard and other greens—kale, mustard greens, spinach, etc.	⅓ cup, cooked	25		.1	.00309	*A*, C, B_2
Cheese, Cheddar	4 slices, ⅛" thick	410	24.4	.93	.0013	A, B_1, G
Chicken	½ medium broiler	109	21.5	.013	.0032	B_1, G
Chocolate, milk	4 pieces, 3" x 1" x ⅛"	552	8.0	.091	.0027	......
Cocoa, beverage	½ cup, scant	92	3.7	.124	.0003	B_1, G
Cookie, sugar, plain	1, 2¼" diameter	47	.7			......

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[1] These figures are for reference, not to be memorized, of course. Pupils may make interesting comparisons and charts from these figures. Sources: Henry C. Sherman and Caroline Sherman Lanford, *Essentials of Nutrition* (adapted), pp. 370–397, The Macmillan Company, New York, 1943; and Dorothy S. Waller, *Nutritive Value of Foods* (adapted), George Wahr, Ann Arbor, Michigan. Used by permission.

[2] Weight of each food is 100 grams.

[3] The amounts of calcium, iron, and thiamin (B_1) are larger if bread is enriched.

[4] Vitamins indicated in italicized letters are especially abundant in the food listed.

FOOD	MEASURE	CALORIES	PROTEIN, GRAMS	CALCIUM, GRAMS	IRON, GRAMS	VITAMINS, BEST SOURCES OF:
Corn, sweet	½ cup; or 2 ears, 6″ long	108	3.7	.006	.00047	B_1, C
Corncake (johnnycake)	2″ x 2″ x 1″	101	2.6			A, B_1
Cornflakes	3 cups	383	8.2	.014	.0027	……
Crackers, graham	10 crackers, 2½″ x 2¾″ x ¼″	420	10.0	.02	.002	……
Crackers, soda	16½	413	9.8	.02	.002	……
Cranberries	1 cup	53	0.4	.013	.0006	……
Cream, thin	⅜ cup	198	2.8	.1	.0002	A, B_1, G
Custard pie	2″ sector, 9″ diameter	178	4.2	.08	.001	B_1, G
Doughnut	1, 3″ diameter, 1½″ thick	200	3.0			……
Eggs, whole	2 medium	148	13.4	.054	.00315	A, B_1, B_2, G
Farina, cooked	½ cup, scant	59	1.8			……
Frankfort sausages	2, 5¼″ long, 1″ diameter	250	19.6	.01	.0025	……
Fudge, chocolate	4 pieces, 1″ cubes	372	2.0	.04	.0004	……
Gelatine dessert, lemon	½ cup	80	1.6			C
Grapefruit (or juice)	½ cup, ½″ pieces; or ½, 4″ diameter	44	0.5	.021	.0003	C, B_1, G
Grape(s)	½ cup; or 20 grapes (Malaga size)	78	1.4	.015	.0007	……
Ham, fresh, lean	3 slices, ⅛″ thick	230	25.0	.02	.003	B_1, G
Hominy, cooked	½ cup	82	2.2	.002	.0002	……
Ice cream, vanilla	½ cup	219	3.5	.08	.002	……
Lamb leg, roasted	2 slices	193	19.7	.011	.0015	B_1, G
Lemon (or juice)	½ cup	44	0.9	.022	.0006	C
Lettuce, leaves	6 large leaves	18	1.2	.069	.0015	A, B_1, C
headed	same weight	18	1.2	.017	.0005	A, B_1, C
Liver, beef	1 piece, 3″ x 4″ x ½″	128	20.4	.011	.0082	A, B_1, B_2, G
Macaroni, cooked	½ cup	89	3.0	.004	.0002	……
Mackerel, fresh	2 cross sections, 2½″ thick	137	18.7	.011	.001	G
Marshmallows	13	328	1.9			……
Mayonnaise	1 tablespoon	103	0.2			……
Milk, whole, fresh	⅜ cup	69	3.3	.118	.0002	B_1, B_2, G
Molasses, cane	⅓ cup	287	2.4	.258	.0093	……
Oatmeal, cooked	½ cup	66	2.7	.012	.0013	B_1
Oleomargarine	7 tablespoons	752	1.2	.02	.0002	……[1]
Orange	1 small, 2½″ diameter	51	0.8	.024	.0004	B_1, C
juice	½ cup, scant	55	0.6	.024	.0004	B_1, C
Oysters	4 large; or ⅓ cup solids	50	6.2	.056	.0058	B_1
Pastry, plain	9″ crust	396	5.3			……
Peach, fresh	1 medium	51	0.5	.01	.00033	A, B_1, B_2, C
Peanut butter	6 tablespoons	604	29.3	.067	.002	B_1, G
Pear, fresh	1 large	70	0.7	.015	.00032	B_1
Peas, canned, drained	½ cup	47	3.0	.016	.0013	B_1, G
Pecans, shelled	¾ cup	734	9.6	.089	.0026	B_1
Pie, apple	⅙ of pie, 9″ diameter	262	2.1			……
Pineapple, fresh	½ cup, diced	58	0.4	.016	.00037	B_1, C
Popcorn, popped	1 cup	43	1.2			……
Pork, lean	1 medium chop, ½″ thick	337	16.6	.02	.003	B_1, G

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[1] No vitamins unless it is fortified with vitamin A.

FOOD	MEASURE	CALORIES	PROTEIN, GRAMS	CALCIUM, GRAMS	IRON, GRAMS	VITAMINS, BEST SOURCES OF:
Potato, sweet	½, medium size	121	1.8			A, B1, C, G
Potato, white	¾ cup, riced; 1, 2½" diameter	85	2.0	.011	.00126	B1, C
Prunes, dried, stewed	12 medium	125	0.6	.02	.001	B1, G
Puffed wheat	½ cup	35	1.3			......
Raisins	¾ cup	345	2.6	.061	.00299	B1
Rice, white, cooked	½ cup	93	1.8	.003	.0003	......
Salmon, canned	⅔ cup	190	20.8	.067	.0013	G
Shredded wheat	3⅓ biscuits	366	10.5	.041	.0045	......
Soup, cream of pea	½ cup	64	2.8			B1
Soup, cream of tomato	⅜ cup	109	3.0			B1, C
Strawberries, fresh	½–⅔ cup	41	0.8	.023	.00094	*C*
Sugar, granulated	½ cup	400	...	...	...	......
Tapioca, cream	½ cup	118	3.6			A, B1
Tomato, raw	1, 2½" diameter	23	1.0	.007	.0006	A, B1, *C*
Tomato juice	⅜ cup, canned	23	1.0	.007	.0004	A, B1, *C*
Veal, leg, lean	1 piece, 3" x 3" x ¾"	143	20.7	.014	.0026	G
Walnuts, English	1⅛ cups, chopped	703	18.4	.089	.0021	B1
Watermelon	1 slice, 2½" x 2½" x 1"	30	0.4	.007	.00023	B1, C

10. Keep a list of the amounts of food you eat for one day. If you eat between meals, add to your list the amounts of food you eat then. How many calories did you have? Did you have some food from each of the "basic seven" groups? What were your best sources of iron, and calcium, and vitamins? Write the changes, if any, you need to make in your diet.

11. Be ready to discuss reasons why a diet that is "good for you" can also be one that tastes good and has a variety of food.

TEST YOURSELF

Read each of these nine statements carefully. Then copy each, using the word or group of words than makes the statement correct.

1. Health is gained by (1) following new diet fads, (2) right living day by day, (3) worrying for fear you will be sick.

2. Food substances are carried to the body cells by (1) the blood, (2) the large intestine, (3) the bile.

3. Saliva acts on food (1) only in the mouth, (2) when the stomach is acid, (3) in the mouth and stomach.

4. You should (1) chew all foods thoroughly, (2) chew only tough foods well, (3) wash food down with water.

5. The process of changing most foods so that they can be used by the cells is completed in (1) the stomach, (2) the small intestine, (3) the large intestine.

6. The stomach *secretes* * (1) bile, (2) pancreatic juice, (3) gastric juice.

7. Strong alcoholic drinks (1) stimulate digestion, (2) have no effect on digestion, (3) hinder digestion.

8. Missing regular bowel movements is a sign that (1) you have bacteria in the large intestine, (2) need a cathartic, (3) should follow better health habits.

9. If you feel nausea, that is, sick at your stomach, and have pain in the abdomen, (1) take a laxative, (2) call a doctor, (3) play ball to forget your troubles.

INTERESTING BOOKS

AMIDON, BRADBURY, and DRENCKHAHN—*Good Food and Nutrition for Young People and Their Families*

BRANDWEIN and others—*You and Your World,* pp. 149-157

FITZPATRICK and BAIN—*Living Things,* pp. 200-209

OBOURN, HEISS, and MONTGOMERY—*Science in Everyday Life,* pp. 454-458

PHILADELPHIA CHILD HEALTH SOCIETY—*Food Value Charts*

WATKINS and PERRY—*Science in Our Modern World,* Books I and II

GOOD TEETH OR BAD?

The children in Athens, Georgia, were wise and fortunate. By May Day every child in six schools who needed to have teeth filled, pulled, or cleaned had gone to the dentist and had had the necessary work done. During the school year they had made the proud record of 100 per cent correction of dental defects. Has your class as good a record?

The following questions about teeth were asked by junior high school boys and girls. Have you asked the same questions? You can find the answers to these and other questions in the next few pages.

Why do we have teeth? Why do we have two sets of teeth?

What are teeth made of? What makes strong teeth? Does the kind of food we eat affect our teeth?

How many teeth are there in the second set?

What makes teeth irregular? If the teeth are crooked and crowded, will pulling out one or two teeth straighten the others? How are teeth straightened?

What is an *abscessed* * tooth? What causes it?

Is it true that abscessed teeth may cause *rheumatism,** heart disease, and other illnesses?

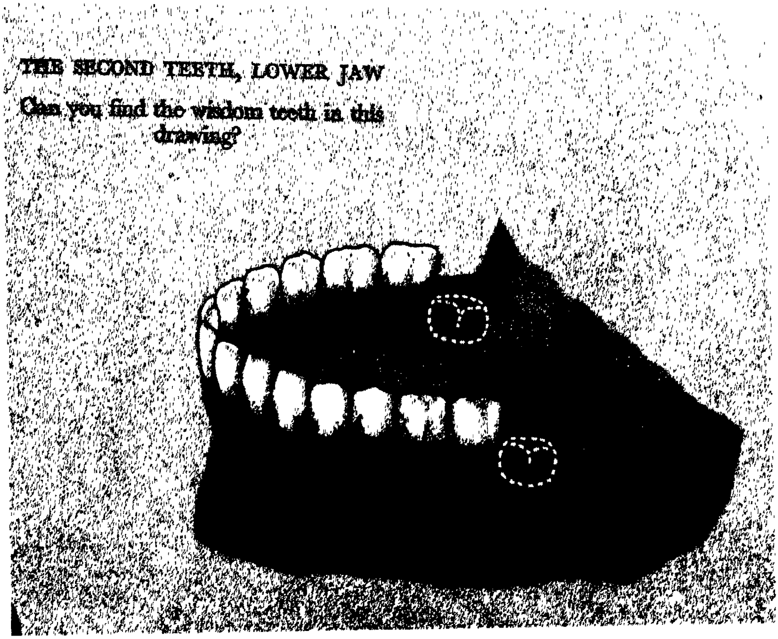
What causes a toothache? Why do teeth decay? How does filling a tooth check decay? Will killing a nerve keep the tooth from decaying?

What strange creatures we would be if we had no teeth! We would mumble. We would not be able to talk distinctly. We would not be able to chew our food. We would have poor digestion. We would not be able to eat many of the foods we now enjoy. Without a good set of teeth we certainly would not look our best. We might lose the job we want. It pays to "protect your smile."

When a baby is about six months old, the first teeth usually begin to push through the gums. "Baby's first tooth" is of great interest to his family. It is usually one of the lower front teeth. By the time a child is two or two and a half years old, he usually has all of his twenty "first teeth."

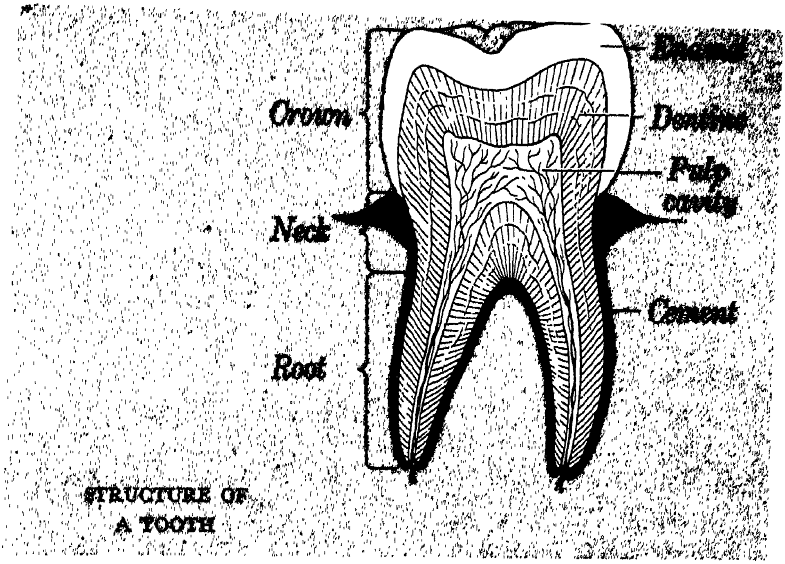
Can you imagine how queer we would look if we had only one set of teeth? Try to picture your little brother's or sister's small teeth in your mouth. Nearly every permanent tooth is twice as big around as the temporary tooth that it displaces. The second teeth are built to fit the larger jaws of older children.

When a child is about six years old, the second teeth begin to appear. Every year after that, until he is twelve or thirteen years old, some of the second teeth are making their appearance. By the time some boys and girls



THE SECOND TEETH, LOWER JAW

Can you find the wisdom teeth in this drawing?



STRUCTURE OF A TOOTH

are thirteen years old, they have a set of second teeth they can well be proud of—regular, white, sound, and well-built. It is not until a person is sixteen or older that he gets the wisdom teeth—the last of the second set. The wisdom teeth, located farthest back in the jaws, complete the set of thirty-two permanent teeth.

HOW TEETH ARE BUILT

Almost three fourths of the tooth consists of phosphorus and calcium. It is these minerals that make teeth strong and hard. Each tooth is built principally of three kinds of material: *enamel,** *dentine,** and *cement.** Enamel is the hard, shiny outside of the tooth, which you see. Under the enamel is dentine, which is softer than the enamel but harder than bone. Covering the dentine of the root is the cement. In the center of the dentine is a space called the *pulp cavity.** In this central space are nerves and blood vessels. In the diagram of a tooth on page 55 you can see that the pulp cavity has openings at the ends of the roots. Through these openings blood vessels and nerves enter the pulp cavity. Notice also the gum line, where the enamel ends.

IRREGULAR TEETH

Sometimes the second teeth come in crooked and crowded for a number of different reasons. The first teeth may have decayed and have been pulled out before the permanent teeth were ready to make their appearance. Without the first teeth to guide them, the second teeth may stagger irregularly into their places.

Another cause of irregular teeth is excessive thumb-sucking or the use of a *pacifier* * when one is a baby. Both of these practices tend to make the roof of the mouth narrow instead of well-developed and roomy.

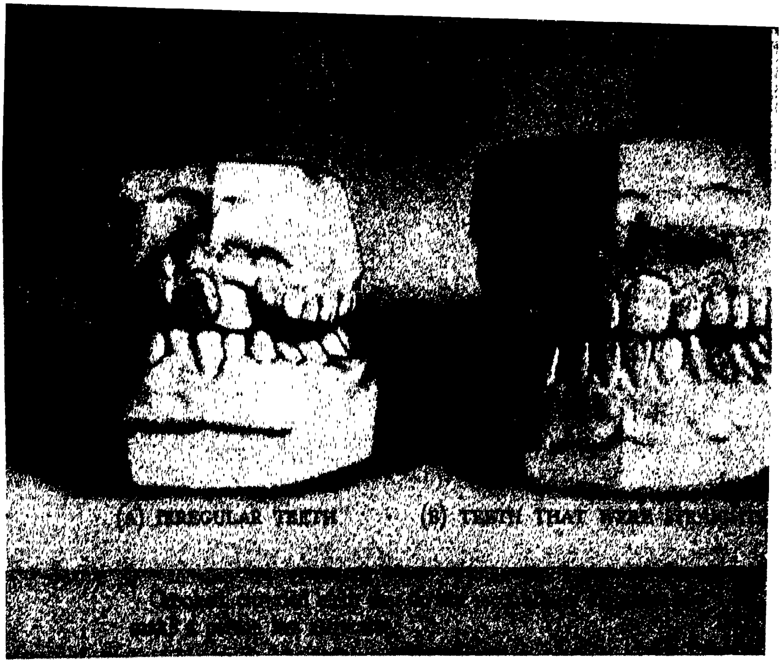
*Adenoids,** which are growths of soft tissue back of the nose, may have the same effect as thumb-sucking. Adenoids block breathing through the nose. The habit of drawing air in through the mouth seems to narrow the jaws.

Still another cause of irregular teeth is failure to use the teeth in vigorous chewing. Chewing substances like tough meat, crisp toast, and raw celery and cabbage helps to develop and broaden the jaws and make room for the new teeth.

If the teeth are irregular, it seldom helps to pull out several teeth in the hope that the others will settle down in their proper places of their own accord. They seldom do. But teeth can be straightened by specialists who know just how to straighten them. The younger the child is, the more successfully can the teeth be straightened. The best age must be decided by the dentist.

Braces made of gold wire are often used to bring ir-

EGGS
DAIRY
BOTTLES



regular teeth gradually into the proper positions. The braces must be fitted carefully and must be adjusted from time to time. Boys and girls who wear braces should follow the dentist's instructions about them.

At first, having braces on the teeth may make one feel different from other persons. But one can learn to be glad rather than ashamed of them.

Irregular teeth may lead to an unhealthy condition of the gums in the following ways:

1. If a tooth is out of place so that it is not used in chewing, the blood will not circulate through the gum as rapidly as it should. The gum tissue may therefore not be very well nourished.

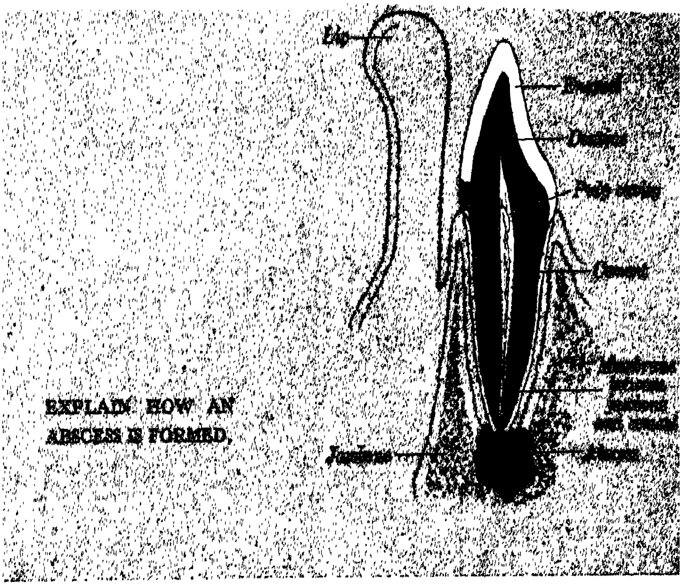
2. If a tooth is out of place so that it receives a good many hard knocks, the gum may be pushed away from the tooth and become red and inflamed. Such a condition

of the gum is favorable to bacteria. Sometimes bacteria that form pus gain entrance into gums that have been injured or irritated in some way. Then inflammation of the gums and even *pyorrhea* * may develop. Signs of pyorrhea were found in the skull of a wolf which lived thousands of years ago. Pyorrhea in its early stages can be cured if the condition that is causing irritation of the gum tissue can be corrected. The thorough cleaning of the teeth by a dentist, the proper use of the toothbrush and of *dental floss* * between those teeth that are close together, and the straightening of crooked teeth are all ways of making the gums more healthy.

Although straightening irregular teeth is well worth while for both health and appearance, it is expensive. The trips to the dentist's office take time. You save time and money by building good teeth in the first place and by giving first teeth the best of care. It is better to try to prevent tooth decay and the expense of repair work. Good care of the teeth is a lifetime investment. Think more about this idea of investing in good habits now for your future health and comfort.

IF YOU NEGLECT A TOOTHACHE—

Would you like to live in a world in which nobody had a toothache? That may some day be possible. But at present tooth decay, or dental *caries,** as the dentist calls it, is our most common physical defect. In many places more than half of the school children have teeth that need to be filled. Toothaches follow decay of the teeth. If you have holes in your teeth, irritating food substances and hot and cold material can come close to the nerves in the pulp cavity. The nerves carry messages of pain to the brain. The dentist cleans out the cavity thoroughly. He is careful not to leave a speck of decaying



EXPLAIN HOW AN ABSCESS IS FORMED.

substance in the tooth. He fills the cavity with a substance that is as hard as the rest of the tooth. Further decay is in this way prevented. Killing the nerve will not stop decay. It will only stop the toothache by preventing messages of pain from being carried to the brain.

But suppose that the person did not go to the dentist. Suppose that he thought, "The dentist will hurt me more than the toothache." What might be the result? The decay eats its way deeper into the dentine. It reaches the pulp cavity. Then the many kinds of bacteria in the mouth have a path into the very center of the tooth. They make the pulp cavity their home. It is dark and warm there. They have plenty of food. They multiply rapidly. They manufacture their poisons. The white blood corpuscles come to the rescue of the tooth. They eat up some of the bacteria. Pus forms. Pus, you know, consists of the dead bodies of bacteria, many dead white blood corpuscles, and dead body cells. An *abscess* *—a pocket of pus—is formed. Then we say the tooth is abscessed.

Often the bacteria win the battle; they keep on making poisons. These bacteria or their poisons make their way through the thin capillary walls. Now they are in the blood stream. Once in the blood stream, they are carried to all parts of the body. They may make trouble in the heart. They may cause pain in any part of the body. These foci of infection—lodging places of bacteria—in the teeth are extremely dangerous.

A boy fourteen years of age came to the doctor because of acute rheumatism. About six weeks before, he had had a severe toothache in his first permanent *molar,** which had a deep cavity. The tooth was pulled out and found to be abscessed. This proved to be the source of his acute illness, which could have damaged his heart.

HOW TO CARE FOR THE TEETH

Have an adequate diet. One way to take proper care of the teeth is to include in the diet enough minerals and vitamins. Calcium and phosphorus are needed for good teeth throughout life, not only to build new tooth structure but also to repair the old. At any age an inadequate diet—that is, daily food that does not supply all the kinds of food needed—may quickly show its effect on the teeth. A quart of milk a day and two vegetables at both lunch and dinner, in addition to other foods, will supply the growing teeth with all the calcium and phosphorus that are needed.

Not only calcium and phosphorus but vitamins also are necessary for good teeth. A lack of vitamin C may result in bleeding gums and an increase in cavities. What are the best sources of vitamin C? Check your answer by the chart on pages 49-51. Vitamin D helps the body to make good use of calcium and phosphorus. Do you remember the foods that are richest in vitamin D?

A study was made of diets of a number of people whose teeth had cavities in them and whose gums were inflamed or showed pyorrhea. (The word *pyorrhea* means *flow of pus.*) All of their diets were found to furnish too little vitamin C and about half of them also too little vitamin D. Oranges, grapefruit, tomatoes, and lettuce, which are rich in vitamin C, added to poor diets, did wonders in keeping the gums healthy and even in preventing decay.

One way in which animals and primitive people keep their teeth and gums in good condition is by eating natural foods. Arctic explorers say that the older Eskimos have excellent teeth. They needed no word for *toothache.* But the younger Eskimos who have replaced the natural foods of their fathers with the white man's diet of white flour, sugar, and muscle meats do not have such good teeth as their fathers.

Get sunlight. Sunlight has a share in building good teeth. Like vitamin D, sunlight helps the body to make good use of calcium and phosphorus. Experiments have proved that sunlight helps to build good teeth.

Avoid mechanical injury. You should avoid mechanical injury to your teeth or gums. Pricking the gums with a toothpick is a mechanical injury. Toothpicks should be used rarely and then with great care. They may cut the gums and aid infection. Biting hard candy or thread and crunching nuts or ice with the teeth may cause mechanical injuries. The enamel of the teeth is built of tiny blocks held together with a cementlike substance. This layer of enamel, hard as it is, may easily be cracked and some of the little blocks loosened and broken off. A toothbrush that is too stiff and used in the wrong way may prick the gums. Cutting the gums by letting dental floss slip as you clean between the teeth is another mechanical injury that should be avoided.

Keep your teeth clean. You should keep your teeth smooth and shining. Some people who would never eat from dirty dishes are far less particular about cleaning their teeth. Many germs of various kinds are found at the gum line and on the teeth.

Feel your teeth with your tongue. Do you find particles of food caught between them? Do your teeth feel slimy? The slimy substance in the saliva gathers on the teeth. Do they feel rough in spots? The rough spots may be *tartar* * that has collected on the teeth. Tartar is the slimy part of the saliva that has gathered up certain animal and mineral matter and has hardened on the teeth.

Like any good workman, you need suitable tools for cleaning the teeth. The most important tool in brushing the teeth is the toothbrush. A toothbrush should be small; one inch is long enough for the part with bristles. The bristles themselves should be about one-half inch long and not longer at one end of the brush than the other. They should be fairly stiff with spaces between the bundles of bristles. Some people buy cheap brushes and throw them away when they begin to shed bristles. Cheap brushes often have soft bristles. A better brush usually lasts longer than several cheap brushes. No brush should be used after it has become too soft to do its work well. Loose bristles are likely to catch between the teeth or in the edges of the gums. Then they may cause inflammation.

A good workman takes care of his tools properly. A toothbrush should not be boiled or rinsed in very hot water. Hot water softens the bristles and changes the shape of the handle. The brush should, however, be well washed after each use. It should be hung in a sunny window if possible. Direct sunlight makes it *sterile,** or free from germs. In a box a toothbrush does not have a good chance to dry. A dirty brush, carrying germs, is worse than no brush at all.

Tooth pastes or powders that contain gritty substances should not be used. Grit scratches the enamel. Tiny bits may break off, and decay may start in the scratches and breaks. Few tooth powders or pastes can remove tartar. If they do, they are not safe to use. A dentist has special instruments to remove tartar safely and well.

We are warned by many dentists to avoid powders or pastes advertised to bleach the teeth. Either they will not do what they are supposed to do, or they are so strong that they harm the enamel. Strong bleaches eat into the enamel and make it rough. The teeth are then likely to become darker than they were before the bleach was used.

Expensive pastes, powders, or mouthwashes are not essential. They cannot "cure" any diseases of the mouth or teeth. They are not "germ killers." It is the careful brushing, not what you put on your toothbrush, that does the most to remove film and particles of food that may decay and cause bad breath. When you buy tooth paste or powder, remember that it cannot work miracles. It will make brushing your teeth pleasanter. Think twice before you spend extra money for something about which extravagant claims are made.

You usually get more for your money in a large tube of tooth paste or box of tooth powder than in several small containers. Read the labels to find out how much the tube or box contains. Note also how much you need to use. Then you can see which is cheapest. Of course you will not waste paste or powder by spilling some of it into the washbasin or using more than is necessary.

Dental floss is needed to get food out from between the teeth. In using it, you should be careful not to let it snap down against the gums.

One good method of brushing the teeth is to place the brush sideways on the gums beyond the gum line and sweep over the gums and teeth at every stroke. The bristles brush over the gums and *massage** them; they do not stick into the gums. Do you see how this method helps the circulation in the gums and sweeps out food particles from between the teeth? By sweeping lightly over the gums, instead of scrubbing across the teeth along the gum line, you avoid injuring the gums or pushing them away from the teeth. Bad methods of brushing the teeth may do more harm than good. Many people hit only the "high spots." Take time to clean all sides of all the teeth and to rinse them with warm water.

Smooth, shining teeth look well. Have you ever thought someone was nice looking until he smiled? Then you saw his dirty teeth and changed your mind. Clean teeth give other people a good impression of you.

Clean the teeth right after eating. This washes away bits of food, bacteria, and acids before they can do harm.

Know conditions in the mouth that help to prevent decay. Most scientists believe that tooth decay has many causes. The teeth may be poorly built and crooked. Such teeth are more likely to decay than well-built, well-placed teeth. A proper amount of *fluorine** in the drinking water clearly helps prevent tooth decay. Children who had always had plenty of fluorine in their drinking water had one nineteenth as many cavities in their teeth as children who had too small an amount of fluorine. Drinking water that has one part of fluorine to a million parts of water has cut the number of cases of dental caries almost in half. Now scientists are trying to find out whether this amount of fluorine will harm health in other ways.

Certain kinds of food, especially carbohydrates, make it easy for bacteria to grow in the mouth. One kind of bacterium—the *bacillus** *acidophilus**—changes carbohydrates into acid. This acid may eat away the enamel. As soon as the hard enamel is eaten away, decay goes on much more quickly in the softer dentine.

In most studies of tooth decay, sugar seems to be the villain. To help prevent tooth decay do not eat candy, cookies, or bread and jelly between meals or before going to bed. *Brush the teeth or at least rinse the mouth right after eating.*

Acids in soft drinks, and even in fruit juices, may also eat into the teeth. Eating fruit is better for the teeth than drinking fruit juices.

Under certain conditions the calcium in the enamel will be dissolved and the cavity will quickly form in the softer dentine of the tooth.

Go to the dentist regularly. You should visit your dentist at least once a year. Your dentist will make your teeth smooth and shining if they need the thorough cleaning he can give them. Only a dentist or a *dental hygienist* * can remove in a satisfactory way all the tartar which has collected on the teeth above the gums and under the gums. The dentist will discover and fill little cavities which, if neglected, might grow larger and larger until they reached the center of the teeth.

If you do not have enough money to go to a private dentist, try to find a dental *clinic* * in your neighborhood where you can have your teeth cared for cheaply and well.

You should choose your dentist as carefully as you choose your doctor. A reliable dentist, like a reliable doctor, has gone to a good school. Avoid the dentist who claims to be "painless" or who advertises to do work at "bargain prices." The total bill of such a man is likely to be more than you expect it to be. He may do hurried or careless work that will cause you a great deal of trouble and expense later. A reliable dentist makes a thorough examination. If he thinks there may be an abscess or a cavity that cannot be seen, he will take *X-ray* * pictures. He works carefully and skillfully.

PROBLEMS TO SOLVE

1. *If you worry about having bad breath or halitosis.** What difference would it make anyway? Why are you worried? What are some of the possible causes? Which of the following would be a good way to go about solving this problem?

Go off by yourself so no one will know.
Wonder whether this is why you are not popular.
Buy a mouth wash advertised to stop unpleasant breath.
See the school nurse about it.
See your own doctor or dentist about it.

2. *If your teeth decay quickly.* First think of the causes of tooth decay. Then ask yourself, "Can I do anything about this?"

Am I eating lots of white bread and sweets?
Do I eat candy or cake between meals?
Do I drink soft drinks?
Do I drink fruit juices when I might eat fresh fruit?
Do I carefully sweep away bits of food around the teeth right after eating?
If I cannot brush my teeth right after eating, do I rinse my mouth well with water?

THINGS TO DO

1. Write in your health diary or log all the health habits mentioned in this unit. Put a star after the habits you have already formed. Practice the others.

2. Get a few pieces of *litmus paper** from your science teacher or from the drugstore. Dip a small blue piece in water to which you have added a few drops of vinegar. What color does the litmus paper become? Acid turns litmus paper pink. Now collect in a glass some saliva from your mouth. Dip a pink piece of litmus paper in the saliva. What color does the litmus paper become? An *alkaline* * substance turns litmus paper blue. Does saliva contain an alkali (an alkaline substance)?

Add a little of your vinegar, which is acid, to the saliva. Dip your piece of litmus paper in the mixture of saliva and acid. What color is your paper now? If you have added only a small amount of the acid, your paper will still be blue. When an acid is mixed with an alkali in the right proportions, each loses its special characteristics; one *neutralizes* * the other, we say.

Get a bottle of one of the artificial orange or lemon drinks and one of the kola drinks. Dip a small piece of blue litmus paper in each of them. Are they acid or alkaline? Might frequent use of them eat away the enamel of the teeth?

3. Watch for new facts about the teeth in the health columns of newspapers and magazines. Bring clippings to school and tell the class what you find.

4. Collect advertisements of tooth pastes and tooth powders. Listen to advertisements over the radio. Look at billboards and at signs in buses or streetcars. Discuss your findings in class, in the light of the facts you have learned.

5. Try a homemade tooth powder made of *precipitated chalk** and a pleasant flavoring. How does it com-

pare with the cleaner you ordinarily use (1) in cleaning your teeth and (2) in cost?

TEST YOURSELF

Some words have been left out of each of these sentences. Write complete sentences in your health diary or log, or take turns in class reading a sentence and adding the missing word or words.

1. When teeth are healthy and clean, they help you to —— your —— and also to —— distinctly.
2. Most children have all their first set of teeth by the time they are —— years old.
3. Second teeth begin to come in when a child is about —— years old.
4. Teeth are built mainly from —— and ——
5. Beginning at the outside, the layers of the teeth are called (1) ——, (2) ——, and (3) —— .
6. Some common causes of irregular teeth are—— and ——.
7. Unless decayed teeth are given care, —— sometimes form.
8. Proper diet is needed at —— ages for the —— and —— of the teeth.
9. Vitamins —— and —— added to the diet of people whose teeth or gums are in poor condition seem to improve the condition of the mouth.
10. To prevent mechanical injury to the enamel and gums, avoid (1) ——, (2) ——, and (3) ——.
11. In buying a toothbrush look for —— bristles and firmly —— bristles.

INTERESTING BOOKS

AMERICAN DENTAL ASSOCIATION—*Teeth, Health, and Appearance*

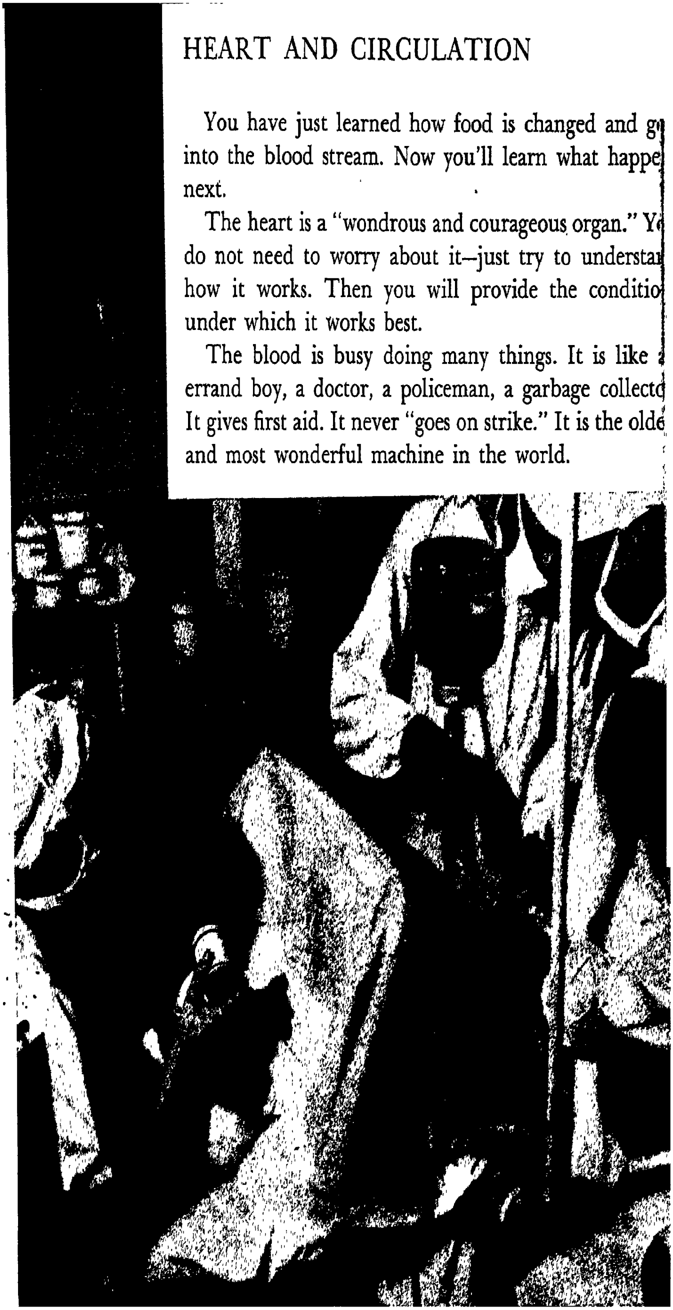
DRENCKHAHN and TAYLOR—*Your Child's Teeth*

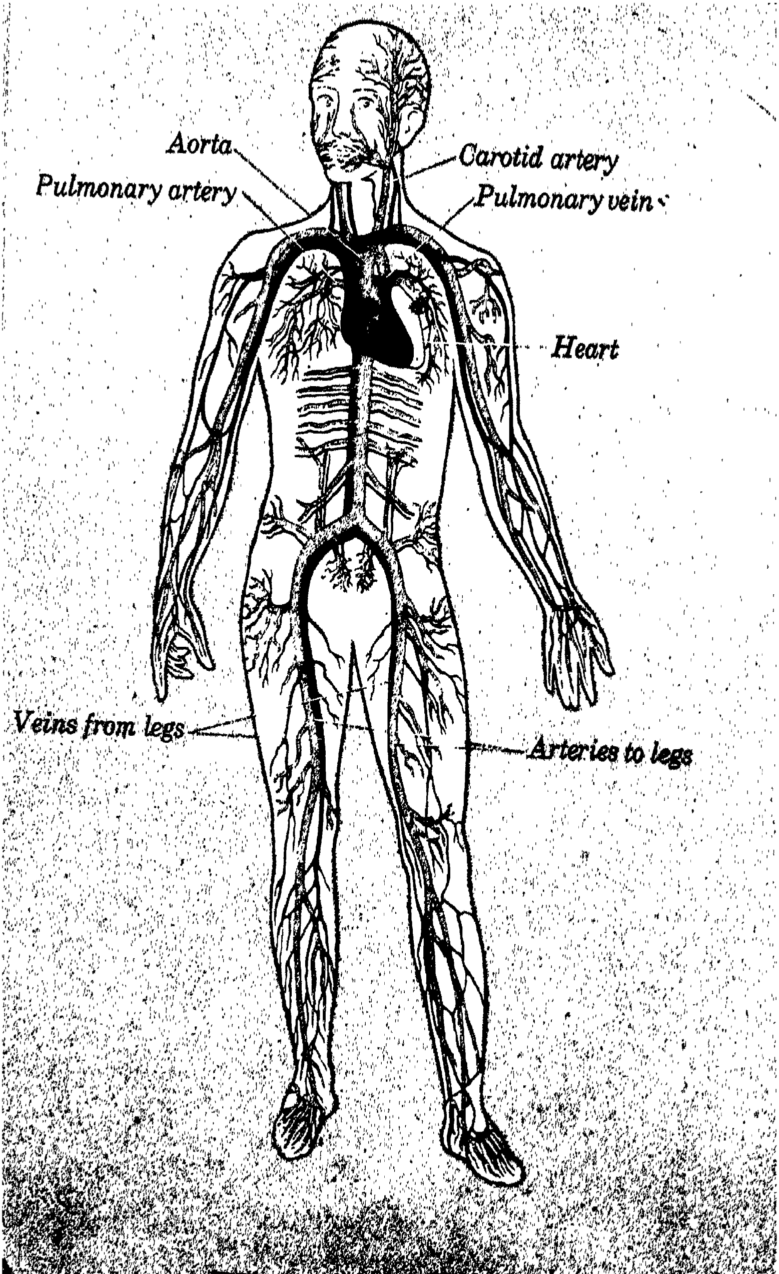
HEART AND CIRCULATION

You have just learned how food is changed and g
into the blood stream. Now you'll learn what happe
next.

The heart is a "wondrous and courageous organ." Y
do not need to worry about it—just try to understa
how it works. Then you will provide the conditio
under which it works best.

The blood is busy doing many things. It is like
errand boy, a doctor, a policeman, a garbage collecto
It gives first aid. It never "goes on strike." It is the olde
and most wonderful machine in the world.




Aorta
Carotid artery
Pulmonary artery
Pulmonary vein
Heart
Veins from legs
Arteries to legs

THE [illegible]

THE CIRCULATORY SYSTEM

Your heart does an unbelievably large amount of work night and day throughout your life. It beats, on the average, about 78 times every minute—more than one hundred thousand times a day, year in and year out. When you were five years old, it beat still faster—about 88 times a minute. When you were born, it was beating still faster—about 136 times a minute. As you grow older, it will beat a little more slowly, on the average, than it does between the ages of ten and fifteen years.

Count the beats at the *artery* * in your wrist. The beating in the arteries is called the *pulse*. It is caused by blood being pushed into the artery by each contraction of the heart. An average *pulse rate* * for people over fifteen years old is about 72 beats per minute. The pulse rate, however, is not always the same. One healthy person may have a pulse rate of 45 beats per minute under certain conditions. Another may have a pulse rate of 100 per minute.

Take the pulse of a friend after he has been sitting quietly for ten minutes. Take it again after he has climbed upstairs and again after he has been running. The heart beats more slowly when you are sleeping than at any other time during the day. What effect does running or climbing upstairs have on the pulse rate? The heart has to work many times as hard during severe exercise as it does at rest.

The heart is always ready for an emergency. At any moment it can contract twice as fast; it can send out twice as much blood per beat as usual. The heart is only about the size of the closed fist of the person to whom it belongs, but it does about as much work in a day as a man of average size would do in climbing halfway up the tallest mountain in the United States or in lifting ninety tons three feet. However, the heart rests between beats, working about nine hours and resting about fifteen hours a day. Getting angry, smoking tobacco, and drinking coffee speed up the heart beat. This may wear out the heart faster.

Boys and girls about your age have asked many questions about the heart and the blood. Test yourself to see how many of the questions you can answer now.

How does the blood circulate through the body? How fast does the blood circulate? How can one improve the circulation?

What is blood? What makes blood red? Can the quality of blood be measured by its color? Why do people eat liver to make red blood?

Can the blood be made thinner? After loss of blood from a wound or nosebleed, how is the lost blood replaced?

Do tonics purify the blood?

Why is blood necessary to the body?

Today the fact that the blood circulates round and round throughout the body is almost as well known as the fact that the earth is round. About three hundred years ago people thought that the blood ebbed and flowed in the *veins* * like the tide or just oozed into the tissues in the same way that water sinks into the earth.

It was William Harvey who in 1628 showed clearly that the blood did not sink slowly into the tissues but rushed through all parts of the body like a river, always flowing back again to the heart, from which it was sent. Harvey made his discovery slowly, step by step.

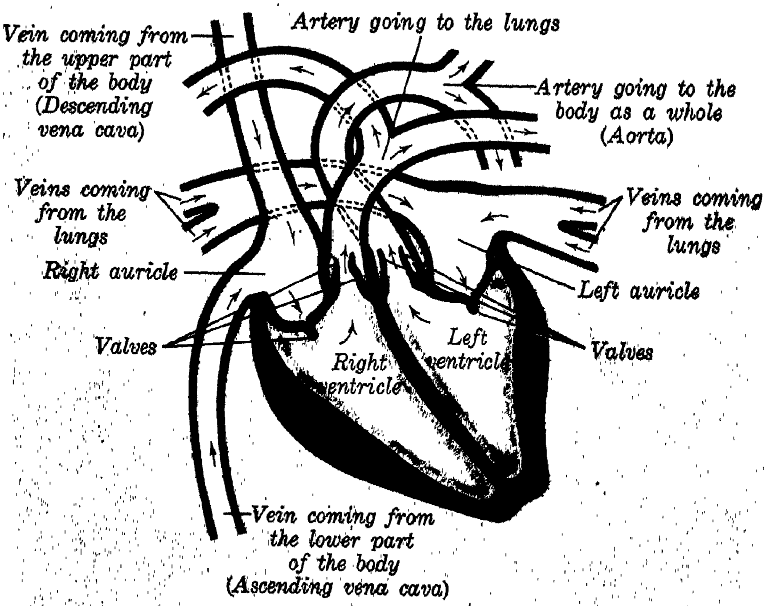
First he noticed that the heart could be felt to harden, as it beat a little oftener than once a second, in the same way that the muscle of the arm hardens when you bend your arm. He therefore thought of the heart as a hollow muscle.

Next he noticed that the artery at the wrist grew larger at about the same time that the heart contracted. This made Harvey think that the arteries must be expanding because the heart was forcing blood into them. Then he watched the hearts of cold-blooded animals like fish. These beat so slowly that Harvey could see the two upper rooms of the heart, called the *auricles,** contract first; then the lower chamber, the *ventricle,** contracted. He saw that the blood was forced out from the ventricle into a large artery and that it returned to the right auricle.

Next he studied the inside of the heart and all the blood vessels leading out from it, as well as the little trapdoorlike *valves* * between the auricles and the ventricles and in the blood vessels. The idea dawned on him that the blood moves about the body in a circle.

It then became clear to Harvey that the blood is squeezed out of the left ventricle into the large artery which carries it to most parts of the body. The large artery branches into smaller and smaller vessels until the tubes become hairlike in size. These are the capillaries. Although it was another scientist who discovered the capillaries, Harvey knew that very small blood vessels unite into larger and larger vessels, the veins. Through these the blood flows until it returns to the upper right-hand side of the heart (the right auricle). When the right auricle contracts, the blood is sent into the right ventricle. When the right ventricle contracts, the blood is pushed out into the artery that goes to the lungs. From the lungs it returns to the left auricle and is ready to be sent down to the left ventricle and out again through the body. All this happens in about twenty-three seconds, less than a half minute. The journey of the blood around the body during violent exercise, such as running a race, may take only twelve seconds. (Trace this journey in the drawing below and on page 70.)

One part of the journey cannot be clearly seen on page 70. This is the large vein from the digestive tract that goes to the liver instead of right back to the heart. If the blood were to carry all the food it picks up from the digestive tract into the main branch of the circulatory system, there would be too much food at some times and too little at other times. So the liver stores the extra supply and sends on as much as is needed.


Vein coming from the upper part of the body (Descending vena cava)
Artery going to the lungs
Artery going to the body as a whole (Aorta)
Veins coming from the lungs
Veins coming from the lungs
Right auricle
Left auricle
Valves
Valves
Right ventricle
Left ventricle
Vein coming from the lower part of the body (Ascending vena cava)

THE HEART AND LARGE BLOOD VESSELS

Follow the flow of blood from the vein coming from the upper part of the body through the heart and out through the artery called the aorta.

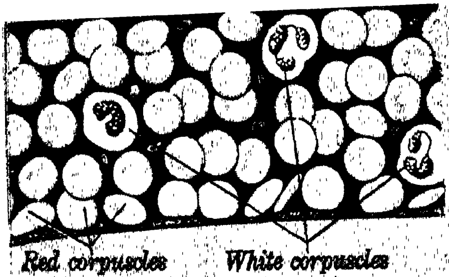
The first push is given to the blood by the heart, but it is helped forward by being squeezed by the elastic walls of the arteries. The arteries contract behind the first onrush of the blood and are ready to receive more blood from the heart. Thus the blood keeps flowing in the right direction. The blood is helped along on its journey through the veins by valves, which prevent it from flowing away from the heart. During exercise the contracting muscles squeeze the blood vessels faster and harder and so help to push the blood along faster.

The activity of the heart is partly controlled by the nervous system. The heart can be made to beat more quickly by action of certain nerves of the *sympathetic nervous system.** These nerves can cause the heart to beat faster and harder; others cause it to beat more slowly and weakly. Still other nerves can change the rhythm of its beat.

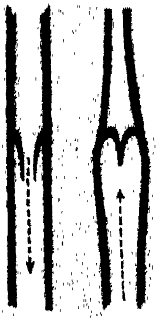
Nerves also chiefly control the amount of food that is sent to different parts of the body. Certain nerves of the sympathetic system help to control the size of the blood vessels, thus allowing more or less blood to flow to different parts of the body as it is needed. When you are swimming, an increased amount of blood is sent to the arms and legs. When you are studying, more blood is sent to the brain. When you are eating dinner and for several hours after dinner, more blood is sent to the stomach and intestines. In this way the heart, directed by the nervous system, tries to meet the needs of the body as a whole.

WHAT IS BLOOD?

"Blood is thicker than water." That is true physiologically. If you wanted to make blood, you might start



CORPUSCLES IN THE BLOOD



THE VALVES IN THE VEINS ACT LIKE DOORS THAT OPEN IN ONLY ONE DIRECTION.

with some sea water. Sea water contains minerals in about the same proportions in which they are found in the blood. To the sea water you should add some protein, such as white of egg, and a speck of the special kind of sugar called glucose. This would give you something like the fluid part of the blood—the *plasma.** It is 90 to 93 per cent water. This watery part of the blood is called *serum* * after the blood has been allowed to *clot.** When blood thickens, as it does after it comes out from a cut, it is said to clot.

To the pale-yellow plasma you would have to add billions of red blood corpuscles. Each is soft, flexible, and elastic and can carry oxygen and *carbon dioxide.** Find a red blood corpuscle in the drawing on this page. Since there are about twenty-four million red corpuscles in one drop of blood, you can imagine how small they must be. How many of them would you have to add to the plasma to make eight pints of blood for a grown person's body? The thirty-one billion red blood cells in one grown person's blood, if laid side by side, would go around the world nearly four times. The higher people live in the mountains, the more red blood cells they have. They need more to get enough oxygen from the thinner air.

It is the red corpuscles that give the red color to the blood. A substance called *haemoglobin* * gives the red color to the corpuscles. The red blood corpuscles seize some of the oxygen that passes through the thin walls of the lungs and into the blood stream. They carry the oxygen from the lungs to all the body cells. It is the haemoglobin—or, rather, the iron in the haemoglobin—that makes it possible for the red corpuscles to carry their load of oxygen to the cells.

The amount of haemoglobin in the blood can be very roughly measured by putting a small drop of a person's blood on a piece of special blotting paper and comparing its color with the various shades of red in a graded scale. There are of course other, much more accurate methods.

Another important test is to make a count of red blood cells under the microscope. A count of around 5,000,000 red corpuscles in a very tiny part (about 1/17,000) of a cubic inch of blood is considered normal.

Next, in making blood, you would add, on the average, one white corpuscle to every 500 red corpuscles. The white corpuscles, as you know, help to protect the body against bacteria. When bacteria are in the body, the white corpuscles squeeze through the cells of the blood vessels. They get rid of bacteria by "eating them up" and carrying them away, together with dead tissue cells and other waste substances.

Some substances in the blood make the bacteria easier to eat. Other substances make them cling together in clumps or settle down wherever they are. There are also substances that neutralize the poisons manufactured by bacteria. Usually these substances in the blood win the battle without our knowing a fight has been going on. But sometimes the bacteria are too many and too lively or the blood has not made enough of these substances to keep the bacteria from doing harm. Then the person becomes sick.

If you put together in the right amounts all the ingredients we have mentioned, you would have a fluid very much like the blood as it circulates through the blood vessels.

Can the blood be made thinner? Very easily. Suppose that you cut your finger. The blood flows. Water is immediately drawn into the blood vessels from the supply of *lymph,** the liquid in which the body cells lie. This added water makes the total amount or volume of blood in the body the same as usual. But red corpuscles have been lost and, when water is added, the blood of course becomes thinner. However, if the person is in good health, new red corpuscles are built quickly to replace those that were lost. Unless the wound is very serious, the red corpuscles lost by bleeding are soon replaced. A person can lose one third of his blood and still live.

As a matter of fact, red corpuscles are being broken down and built up all the time. About 600,000,000,000 to 1,500,000,000,000 wear out every day. Part of the iron from these worn-out red cells is saved to make new haemoglobin. The breaking-down process takes place in the *spleen,** in the liver, and in the soft red *marrow* * that fills the hollow centers of some bones. The building-up process takes place in the marrow. A red corpuscle lives only about a month. Then a new one takes its place.

A person who has lost a great deal of blood—from a cut, for example—may not be able to replace this blood soon enough to help him recover. Blood from another person may be put into his veins. This process of transferring blood from one person to another is called *blood transfusion.** Transfusions may also be given to a person who does not build up enough healthy blood corpuscles in his own body. Although the transfused blood cells do not live long, they cause the bone marrow to make more cells faster. You may have read a story of how a blood transfusion saved someone's life. (See page 69.)

The transfusion is given very carefully to prevent bacteria from being carried into the vein. The person who gives the blood must be healthy and have no disease that might be transferred. Because human blood is of various types, transfusion must be given to a person of one blood type from another person of the same blood type. Tests of both persons' blood must be made before the transfusion. A number of people may have to be tested before a person with the right type of blood is found. To avoid the loss of time in emergencies, some hospitals have *blood banks.** Blood that has been tested and labeled is treated to keep it from clotting. This is kept in a refrigerator, perhaps for a number of weeks. Then when a transfusion is needed, blood can be drawn from the "bank" in a few minutes.

In certain cases, as in burns, the loss is not in whole blood but in the watery part of the blood only. Blood plasma, instead of whole blood, is therefore used. For this purpose blood plasma is collected and dried. When it is needed, *distilled water* * is added to the dried plasma and the transfusion is made. A soldier or an explorer can carry in his pocket enough plasma for a transfusion.

Blood plasma saved the lives of many service men in

World War II. It is also used to save civilians. North Dakota has a free plasma service. The blood is obtained from volunteer donors—that is, persons who are willing to give their blood for this good cause. Each donor is given a physical examination and fruit juice before the blood is obtained. After the blood has been drawn, he receives a card saying that he has done a public service to the state of North Dakota. The blood is then tested and the plasma separated and dried. It is put in a package with everything needed to make the transfusion. Any doctor in the state who needs plasma for serious burns, *shock,** bleeding, or other condition may have the package free of charge.

WHY IS BLOOD NECESSARY?

Blood is the great carrier for the body. It carries food from the small intestine to the cells. The red blood corpuscles are like errand boys. They carry oxygen from the lungs to the cells. They take excess carbon dioxide from the cells to the lungs. In the lungs they exchange the carbon dioxide for oxygen and set out on the same kind of errand again. The blood carries other wastes from the cells to the liver and *kidneys,** whose duty it is to get rid of waste matter. There is no such thing as "pure" blood. In some parts of the body there is always waste matter in the blood. It is part of the blood's work to carry wastes away from the cells.

But the blood very quickly gets rid of its load of waste and keeps just about the same *composition* * day after day. The kidneys help to keep the right amount of each essential substance in the blood. If there is too much salt in the blood, some is got rid of—excreted. The kidneys excrete the excess substances until the blood is brought back to its normal composition. If a doctor finds a change in the blood, such as a larger percentage of sugar than usual, he suspects disease.

The blood, as you have already learned, helps to keep the body temperature about the same. It carries heat to cold parts of the body. When the capillaries contract, the body is protected from loss of heat through the skin.

Blood supplies the lymph, which bathes the cells. The watery part of the blood, the serum, seeps through the walls of the capillaries and fills the space between cells. The lymph may be compared to the water in a swamp, and the blood flowing through the blood vessels, to streams flowing through the swamp. Lymph can pass back and forth through the capillary walls.

You may have heard people talk of *"purifying* * the blood" and buying blood "purifiers" and tonics. Some of these patent medicines are like a whip used to drive a sick or tired horse farther. They do not make the person who uses them well or really rested.

Tonics may contain alcohol or harmful drugs. Sometimes they are made of a few cents' worth of some less harmful substances but are sold at high prices. The United States government has made a study of tonics and other patent medicines. From its reports you may wonder how anyone could imagine they are helping him to feel better. Iceland prevents the wide use of harmful drugs by not permitting the makers of these drugs to advertise except in medical magazines.

Other people believe tonics will "build blood." The best ways to build blood are to eat well-balanced meals, to rest before you are too tired, to get your share of fresh air and sunshine, to follow other healthful ways of living, and to do just what the doctor tells you after he has made a thorough examination.

Now that you have an idea of what the blood is, what it does, and how it circulates throughout the body, you will see more clearly your responsibility.

1. *You can help your body build red blood corpuscles.* More red corpuscles are needed as you grow larger. Millions are wearing out every day. Sometimes still more are lost through accidents or are destroyed by infections and disease, as in the case of *hookworm disease,** *malaria,** and *tuberculosis.** If you do not keep your blood count and your haemoglobin up to normal, you will become *anemic.** People who have too few red corpuscles or too little haemoglobin in each corpuscle are said to have *anemia,** which may be of different kinds. The person having anemia has a tired feeling most of the time. His blood cannot carry the oxygen which is essential to mental and physical vigor.

Since iron helps to make red blood, you should surely include sufficient iron in your diet. "Sufficient" iron for boys and girls, you may remember, is about .013 gram per day. This amount will be supplied by a quart of milk, six slices of whole-wheat bread, one egg, one large orange, two medium-sized potatoes, a large serving of spinach or other green-leaf vegetables, or four prunes. Other good sources of iron that will help increase the haemoglobin are liver, peaches, dried peas and beans, lean beef, oysters, carrots, and oatmeal.

Probably you have noticed that people who exercise out of doors usually have red cheeks. Exercise calls for more oxygen. Oxygen calls for haemoglobin in the red blood corpuscles. Haemoglobin calls for iron. The need for more haemoglobin leads to the increased production of red corpuscles. More haemoglobin cannot be produced

unless there is sufficient iron in the diet and nothing interferes with the building of red blood corpuscles.

Is taking an iron tonic a good way to supply iron? The iron in a tonic does not seem to be so useful in manufacturing haemoglobin as is the iron in foods. Even if the doctor orders iron, you should also be sure to eat foods rich in iron. Look again on pages 49-51 to see which foods are rich in iron.

Recently liver has been found to be very valuable in making red blood. In one experiment haemoglobin was produced more rapidly when liver was fed in large amounts than when other foods were eaten. Preparations made of liver may be fed to an anemic person instead of the liver itself. Similar preparations are sometimes *injected** into his body to aid him to get well if he has one of the more serious kinds of anemia.

Of course not only iron is necessary for a good circulation; the diet must be adequate in every respect. The heart muscle itself quickly suffers from lack of nourishment. Food and oxygen are carried to the heart and waste products are removed by special blood vessels. The heart uses one-twentieth of the blood in circulation for itself.

2. *You can try to prevent infection.* Bacteria may cause serious damage to the heart and arteries as well as to the kidneys and other organs. Bacteria or their poisons in diseased *tonsils,** in a sore throat, in abscessed teeth, or in an infected appendix can easily get into the blood stream and be carried to the heart.

What effect do bacteria have on the heart? Sometimes their poisons, or toxins, make the heart muscles flabby. Then they cannot contract forcibly. If this happens, the heart has to make a greater effort to do the same amount of work that it did before. Bacteria may cause injury to the valves of the heart. This is the chief danger in rheumatic fever. When these valves are injured by bacteria, they sometimes become too tight or they do not close tightly enough. Blood is thus held up or allowed to leak back. The heart must, in either case, work harder to send the usual amount of blood to all parts of the body. If the valves have been injured in this way by bacteria, the heart sometimes gradually grows bigger and stronger so that it can do the extra work. Although the blood does its best to protect the heart from infections, it needs your help in keeping as many germs as possible out of the body. When the bacteria are too many and too lively or the blood is not prepared to deal with them, then the person becomes sick.

3. *You can avoid strains.* During an illness in which you have a fever, special care should be taken not to add the strain of physical exertion to the strain put upon the heart by the illness. For this and other reasons bed is usually the best place when you are ill, even with a severe cold. Children's diseases, *scarlet fever,** influenza, pneumonia, and some other diseases are likely to affect the heart. Even after a child feels well again, he may have to stay in bed or have very little exercise to prevent strain on the weakened heart. If he exercises and rests as much as the doctor advises, he usually is able to recover without permanent injury to his heart.

4. *You can take exercise suitable for you.* Everyone who expects to play on athletic teams or run races should have his heart examined before beginning to train. If your heart has been weakened by disease, you should find out from a doctor the amount of exercise you can safely take. By taking carefully graded exercises a person can often strengthen his heart so that it can do its work fairly well. You should follow the doctor's advice con-

cerning the amount and kind of exercise that is best for you.

When a person is quiet, the waste products collect in the lymph. Exercise will, by increasing the flow of blood and lymph, cause this waste to be carried more rapidly to the lungs and kidneys and thus sent out of the body. Moderate exercise also tends to improve poor circulation.

Moderate exercise is beneficial to the average person; violent exercise may under certain conditions do harm. The games and sports you enjoy—baseball, handball, roller skating, swimming, and many others—are healthful for most people. It is chiefly endurance contests, such as cross-country running, crew racing, six-day bicycle racing, long-distance swimming, and the like, that put a severe strain on the heart and demand a long period of training.

5. *You can get your share of rest and sleep.* One of the best ways in which you can aid your heart is by resting and sleeping nine or ten hours every night. The sleep that refreshes you rests your heart also. Your heart beats more slowly when you are lying down quietly than when you are sitting, standing, or moving. You know how quickly it beats when you have been hurrying. At each beat the heart is doing work equal to lifting a two-pound weight one foot from the ground. Going to bed at nine instead of at eleven o'clock saves the heart during a year an amount of work equal to lifting 800,000 pounds a foot from the ground. Lying down a half hour during the daytime also saves the heart work. A good balance of work and rest is best.

The healthy person of course seldom thinks about his heart. He exercises moderately. He plays games wholeheartedly. He rests when he is tired. The heart takes care of itself. It would be a great deal of trouble if you had to tell your heart to beat faster every time you began to skate or started to run to first base.

6. *You can stand, sit, and walk in good posture.* How does good posture aid the heart? If the posture is good, the heart will have its normal space in which to work. If the posture is poor and the chest is cramped, there is pressure on the heart; it cannot do its work so well. A poor posture is often a slouchy position in which the chest is cramped, the abdomen slumps down, and the heart sags. The heart cannot pump so well if the body is in this sagging position. At the same time the blood in the sagging abdomen tends to return to the heart more slowly. Do you see how improvement in posture might improve the circulation also?

7. *You can avoid tight bands on any part of the body.* Tight garters, for example, interfere with the return of the blood to the heart. Interference with the circulation is one cause of *varicose veins,** that is, veins that have become swollen. Instead of promptly flowing back to the heart, the blood in varicose veins in the legs tends to remain in these swollen veins. The valves in the veins grow weaker and do not keep the blood flowing in the right direction as they should do. Moderate exercise and avoiding tight garters are ways of preventing varicose veins.

8. *You can learn to take things calmly.* If you find out what to do in a difficult situation, you will not be so worried or afraid. If you think of the other person and how he is feeling, you will not feel so angry at him. Worry, excitement, fear, anger, and other emotions make the heart beat faster and send the blood out with increased force. You have probably noticed how much more quickly and strongly your heart beats when you are afraid or excited. Continued excitement or worry causes

Many people donate blood to help others.

extra and useless strain on the heart and on the walls of the blood vessels. It may cause serious heart trouble.

9. *Do not drink alcoholic beverages.* Alcohol causes the heart to beat more rapidly at first. Under the influence of alcohol there is a slight *paralysis* * of the walls of certain of the blood vessels, particularly those in the skin. This causes them to widen. More blood flows into them. The heart must beat harder and more rapidly to fill them. When the heart has to work harder than usual over a period of time, it tends to grow larger and its walls become thicker. Sometimes part of the muscular tissue is replaced by fat or fiber tissue when a person eats too much, and drinks too much, and exercises too little. The fat or fiber tissue is somewhat like dead wood in a tree. The valves may lose their elasticity. The walls of the blood vessels may become thick and lose their elasticity. Sometimes a blood vessel in the brain becomes so weak or brittle that it breaks.

10. *Avoid tobacco and drugs.* Tobacco usually causes the heart to beat faster because the poison in tobacco, *nicotine,** acts upon the *adrenal glands* * to make them pour out more adrenin. As in excitement, the greater secretion of adrenin causes a faster heartbeat.

The action of tobacco in various amounts on the circulatory system is as follows: "There is ordinarily an increase in pulse rate of 5 to 10 beats per minute; there is a slight rise in *blood pressure.** . . . Ordinarily an individual suffers no disadvantage from this slight increase in pulse rate and slight rise in blood pressure. But even in the use of moderate amounts, whenever there is an unusual strain put upon the circulatory system, as in the stress of an athletic contest, the individual may become breathless from the exertion. The heart is apparently less efficient in periods of strain. For that reason, it is a common practice among coaches of athletic teams to forbid the use of tobacco during the training period. In the use of immoderate amounts [of tobacco], a man may suffer from *palpitation* * [a fluttering of the heart] and disturbance of the rhythm of the heart. This latter condition while very common in the young is especially noticeable after the age of fifty. . . . [The] opinion seems to be that excessive amounts favor the development of *arterial sclerosis* * [hardening of the arteries]. Severe irregularities of the heart may result in sudden death during middle life, and this is seen especially in heavy smokers. . . . In all these disturbances of the circulation which I have mentioned, a discontinuance of the weed results in the disappearance of the symptoms." [1]

Drugs, especially those contained in certain headache medicines and pain remedies, often cause a temporary weakening of the beat of the heart. Never use these headache medicines and pain remedies except under the direct supervision of a physician.

THINGS TO DO

1. Find the artery in your wrist. Put your finger lightly on it. Count the number of beats in a minute. Why does the doctor almost always do this (take the pulse, as he says) when he comes to see a sick person?
2. Make a series of posters showing ways in which a person can help the heart do its strenuous work. It would be a good idea for you to illustrate each of the ten points given in pages 82-90.
3. What foods rich in iron will supply the iron you need every day?

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[1] Walter L. Mendenhall, *Tobacco*, pages 25, 26; Harvard University Press.

PROBLEMS TO SOLVE

How can you learn to take things calmly? How can you handle situations like these?

"I had finished my homework and was sitting in the living room. My stepfather said if I didn't study, I'd have to go to summer school. Jokingly I said I wouldn't, and he, misunderstanding me, smacked me."

"Last month I brought my report card home. I had passed social studies, which I had never been able to pass, but my marks had gone down in two other subjects. My mother said, 'Well. you can't go out for ten weeks. And don't come home next time if you have a mark lower than a B.' I couldn't help feeling angry at my mother, because it meant no dances, no basketball games, no fun at all."

"One afternoon I went to a movie with a boy without consulting my mother. She told me I couldn't go out the next afternoon. My boy friend was mad because we had planned something with his parents weeks in advance. My mother should at least have given me a chance to explain before pouncing punishment on me."

It is, indeed, difficult to be calm when parents and teachers don't listen or understand. Show how you would handle these situations by role-playing.

DISCUSSION QUESTIONS

Which of the following statements are true? How should the untrue statements be changed so that they will be correct?

1. As a person grows older his heart beats more rapidly.
2. The pulse of a healthy person is always about 72 beats per minute.
3. The heart rests between beats.

4. The contractions of the heart are the only aids to circulation of the blood.

5. The iron in haemoglobin carries food to the cells.

6. Red corpuscles live about a month.

7. The red corpuscles help to remove and destroy bacteria.

8. A well person's blood is pure.

9. The kidneys help to keep the composition of the blood about the same from day to day.

10. Food containing iron is necessary for both children and grown people.

11. Liver and other foods rich in iron help to give you rosy cheeks.

12. To improve poor circulation, begin strenuous exercises at once.

13. To rest in bed after an illness will weaken a person and delay his recovery.

14. If you are frightened, your heart comes up in your throat.

15. Good posture makes it easier for the heart to do its work.

16. Continued drinking of alcoholic beverages is likely to injure the heart and blood vessels.

INTERESTING BOOKS

BRANDWEIN and others—*You and Your World,* pp. 100-109

FITZPATRICK and BAIN—*Living Things,* pp. 227-232

RAY and WASHBURN—*Are You Fit to Be a Pilot?*

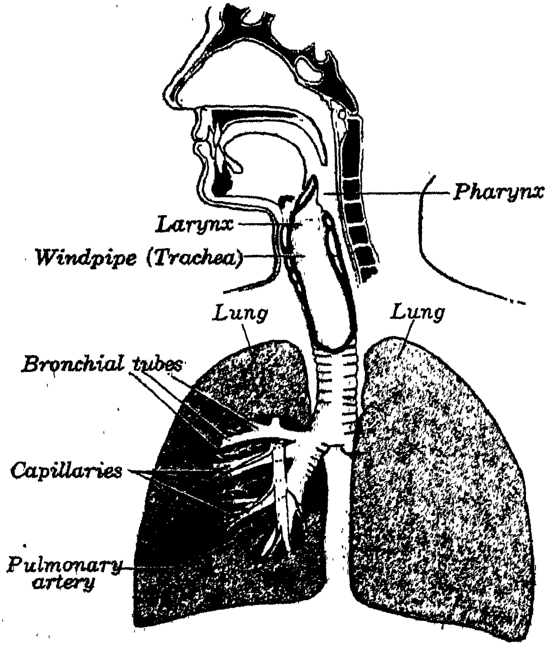
RIEDMAN—*Your Blood and You*

WATKINS and PERRY—*Understanding Science*

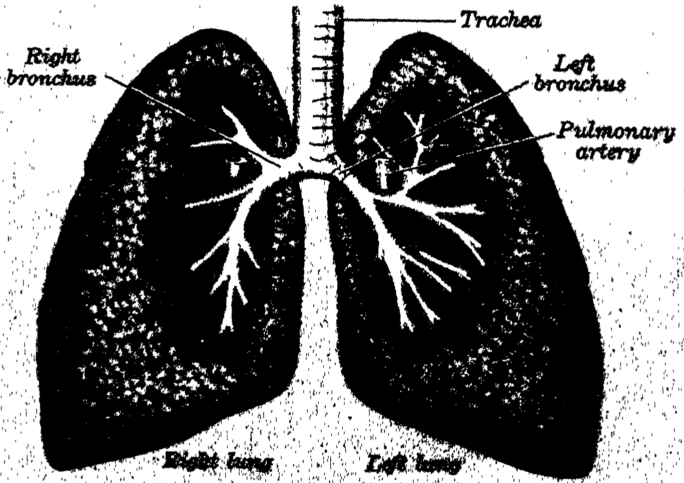
HOW YOU BREATHE, HEAR, AND SEE

When you build a fire, it will not burn unless it ha air. So it is with the busiest little engines in the world–the cells of your body. You breathe air into your lungs The air supplies oxygen. The oxygen is carried by the blood to all the cells. The waste carbon dioxide is carried back to the lungs and is breathed out. Are there any ways to make your lungs stronger and more efficient

Is poor hearing a problem for you or for someone you know? Might poor hearing make school difficult? Migh it cause trouble in making friends? Might poor eyesigh also cause difficulty? How can you prevent trouble with eyes and ears?



THE RESPIRATORY* SYSTEM



HOW AIR REACHES THE LUNGS

THE RESPIRATORY SYSTEM

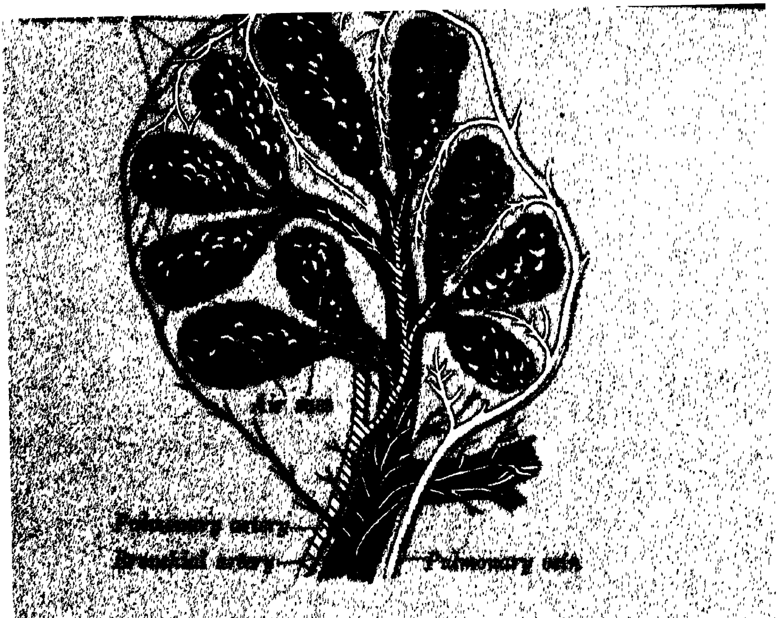
Do you know what illness causes the largest amount of absence in your class? Among 5000 school children in Hagerstown, Maryland, 30 per cent of the absences due to illness from one December to the following May was caused by colds. In colleges, too, colds bring students to the doctor's office more frequently than any other complaint. In business colds are the chief illness that makes employees lose time and money. Among 6700 workers in a large insurance company, during one year, there were 2824 colds, which made each person suffering with a cold lose an average of 2.2 days. Colds caused more loss of money than any other illness. The "common cold" should become very much less common. Don't you think so?

In order to understand better how to recognize, help to prevent, and treat colds, it will be useful to learn more about the respiratory system—the nose, throat, and lungs.

Of course you are breathing now. As you breathe in and out, you are constantly changing part of the air in your lungs. You are probably breathing in and out about twenty times a minute. Breathing in and breathing out once is called a respiration. The number of respirations in an adult is about seventeen or eighteen a minute.

THE PARTS OF THE RESPIRATORY SYSTEM

Where does the air you inhale (breathe in) go? If you are breathing through your nose—the correct way to breathe—the air passes first over the moist, warm

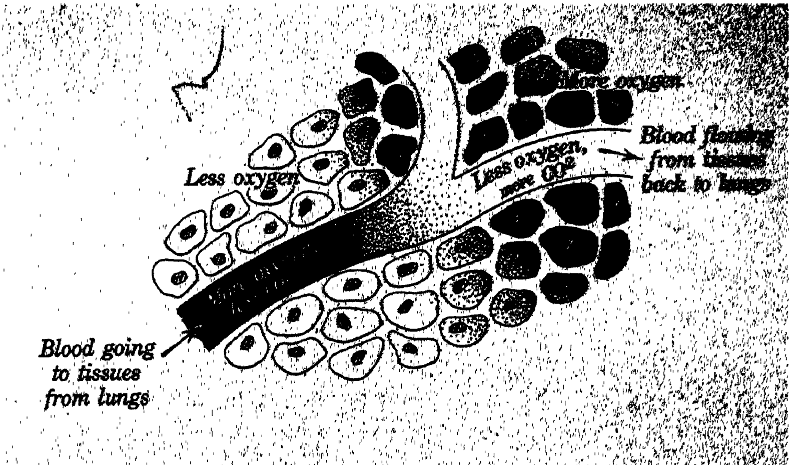


TRACE THE CIRCULATION OF BLOOD IN THIS PART OF A LUNG.

lining of the nose. This lining is a membrane somewhat like that of the mouth and the digestive tract. It secretes mucus, a watery, somewhat sticky fluid.

In passing through the nose, the air that is inhaled is warmed and moistened. The air is also cleaned. A person may breathe in several million dust particles every minute, but they are caught in the nose and throat. In the *nasal** cavity there are small hairs, which you can see. These catch the larger bits of dust. The velvetlike part of the mucous membrane catches fine dust and other substances in the air, including bacteria. Your air-conditioning system cleans and warms the air you breathe.

From the nose the air passes through the throat and *larynx,** or voice box; down the windpipe (or *trachea**);


More oxygen
Blood flowing from tissues back to lungs
Less oxygen
Less oxygen, more CO_2
Blood going to tissues from lungs

AS THE BLOOD FLOWS ON, IT LOSES ITS OXYGEN TO THE CELLS. WHAT DO THE CELLS CONTRIBUTE TO THE BLOOD?

and through the *bronchial tubes* * (or *bronchi*) into the thin-walled air sacs of the lungs. Trace the journey of the air to the air sacs of the lungs in the diagrams on page 94. Clinging close to the thin-walled air sacs are capillaries. The oxygen in the lungs is separated from the red blood corpuscles by the thin walls of the capillaries and the thin walls of the air sacs. If all the air sacs in the lungs were spread out flat, they would cover about 1100 square feet. If all the capillaries in the lungs were spread out flat, they would cover more than 800 square feet. Thus there is a very large area for exchange of oxygen and carbon dioxide.

Then where does the air go? The oxygen in the air must reach the red blood corpuscles so that they may carry it to all the body cells that need it. By passing through the thin walls of the lung cells and through the thin walls of the capillaries, the oxygen reaches the red corpuscles. The oxygen is then held prisoner by the haemoglobin in the red blood corpuscles until it is given to body tissues that need it. All living cells need oxygen. There are certain nerve cells which, if they have no oxygen for more than eight minutes, are harmed so seriously that they never recover.

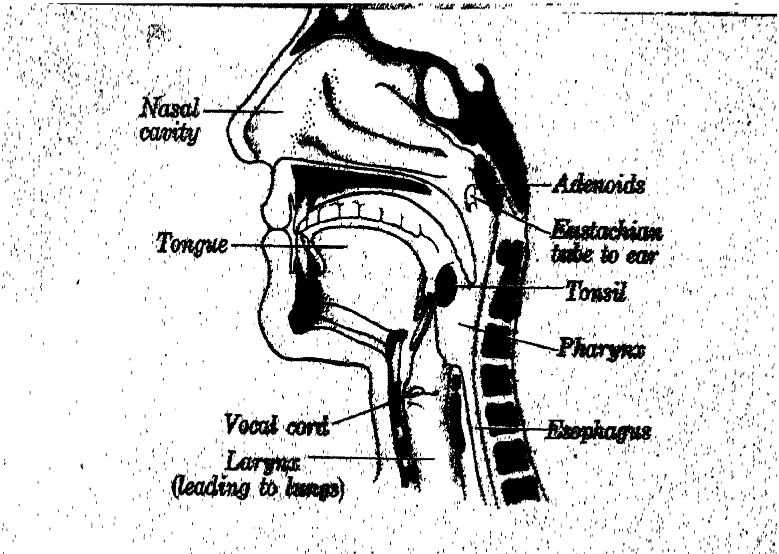
HOW THE LUNGS WORK

Look at the skeletons on page 149. Notice the ribs of each. Raising the ribs makes the chest cavity larger. In poor posture the ribs sag downward. In good posture the ribs are raised. In which case is the chest cavity larger? Put your hand on your ribs and take a deep breath. Did you feel the ribs rise? Breathe out. Did you feel the ribs move lower? The lungs, which lie inside the ribs, always follow the ribs in their movements. So, when the ribs are raised, the air rushes in and the lungs become larger. When the ribs are lowered, the air rushes out and the lungs become smaller.

Has the chest cavity a bottom? Yes, the floor of the chest is a large muscle, the *diaphragm.** When you breathe in, the center of the diaphragm is pulled downward. What effect does this have on the chest cavity?

What is the correct way to breathe? The correct way to breathe is to use the organs of respiration in a natural way. Breathe through the nose. Sometimes the airway through the nose is blocked by the spongy growths called adenoids, behind the nose and above the throat. (See the diagram on page 99.) Mouth breathing is often the result of adenoids.

Some people use only the top part of the chest in breathing. Others breathe deeply, using the diaphragm as well as the ribs. Deep breathing improves the circulation of blood in the organs of the abdomen. Knowing about the valves in the veins, can you explain why deep breathing improves the abdominal circulation?



INSIDE THE NOSE AND THROAT

There is a reason for breathing deeply when you are exercising vigorously. The muscles are calling for more oxygen. The more vigorously they work, the more oxygen they use. The amount of oxygen used by the cells is determined by their needs, not by the depth or rate of breathing. To force back your shoulders and breathe vigorously is poor form and is of little use. Ordinarily the blood carries about three and one half times as much oxygen as is needed.

Part of the air you take in with each breath remains in the lungs until it has given up most of its oxygen. Deep breathing may help to stir and replace this air with fresh air and more oxygen. Another advantage of correct, deep breathing is that you naturally tend to stand and sit in good posture when you breathe properly. Singers and speakers know how important it is to breathe correctly. Nervousness and embarrassment can often be prevented or overcome by taking a few steady, deep breaths.

Sometimes the methods described on page 96 do not get rid of all irritating substances, such as dust particles, in the lining of the throat or bronchial tubes. Then we cough. Coughing often helps to bring up mucus and with it the dust particles. Sometimes the irritation caused by dust, dirt, smoke, or germs results in inflammation of the throat or bronchial tubes. The inflammation may be due to *bacteria*. Coughing sometimes helps to get rid of bacteria in the same way that it helps to get rid of dust. But coughing may also increase the irritation. (The ending *itis* usually means *inflammation*. *Tonsillitis*,* for example, is inflammation of the tonsils.)

WHAT KIND OF CLIMATE IS BEST?

People with respiratory diseases used to go to very dry climates. But air that is too dry is likely to be irritating. It makes the mucous membrane too dry. Air that is too moist—has too high a humidity, too high a percentage of moisture in it—is uncomfortable. The air on a high mountain has less oxygen in it than the air at sea level. As you climb a high mountain you are working hard and getting less oxygen than usual because there is less oxygen in the air. The lack of oxygen affects both the lungs and the circulation. You cannot exercise so vigorously as you did at the foot of the mountain. When you go to the mountains and are at a high altitude, you must be careful not to exercise too hard at first.

Men who climb very high mountains frequently make camp part of the way up and stay at that camp for a few days until they have rested from the earlier part of the climb and have become adjusted to the altitude. Because they are in training, they can make this adjustment sooner than other people could. Ordinarily after a per-

WHY DO MOUNTAIN CLIMBERS OFTEN STOP TO REST?

son has stayed at a high elevation four or five weeks, more red blood corpuscles are formed and the haemoglobin is increased. The larger amount of haemoglobin carries a larger amount of oxygen. Thus sufficient oxygen can be carried to the muscles, and they can do their work as well as usual.

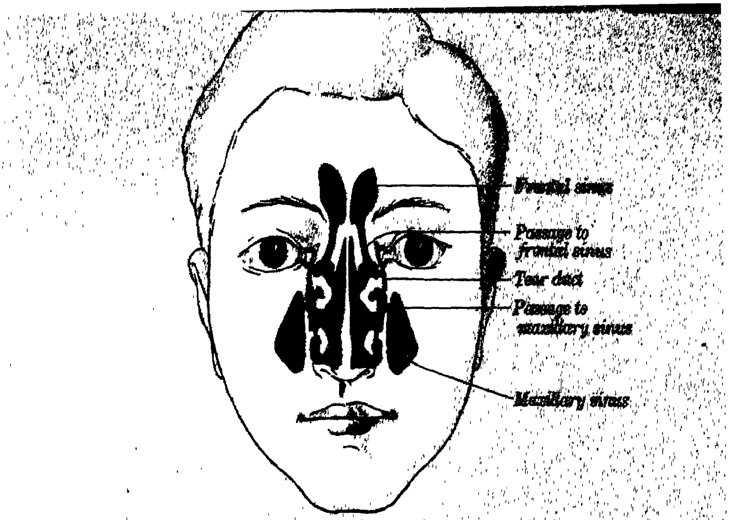
Perhaps the best climate is right where you are—provided that you make your habits of living fit that climate.

THE MOST COMMON RESPIRATORY DISEASE—A COLD

THE SYMPTOMS AND CAUSES OF A COLD

The first symptom of a cold is a pricking, or burning, feeling in the back of the nose or any other part of the upper respiratory tract. As the cold gets worse, the mucous membranes become red and swollen, the nostrils feel "stuffed up," the "nose runs." Headache and pain in the face are common. The person cannot taste, smell, or hear as well as usual. The voice becomes hoarse when the infection spreads to the larynx. Coughing, which gives no relief from the irritation, is often one of the most annoying symptoms. The person feels tired and does not want to work or play. These are symptoms of the common cold.

If the cold gets worse, the infection may spread to the *sinuses.** The drawing on page 103 shows how the hollow spaces in the bones of the face, the sinuses, are connected. (See also the drawing on page 99.) You can see how bacteria in the throat and nose may spread into the ears as well as into the sinuses. You have perhaps known someone who has had sinus trouble and have heard him tell how much pain infection in a sinus causes.



THE BLACK PARTS SHOW THE CAVITIES AND SOME PATHWAYS OF POSSIBLE INFECTION IN THE HEAD.

The openings from the sinuses into the nose are very small. Pus and mucus cannot drain from them readily. Bacteria or infection from decayed and abscessed teeth may cause sinus infection. Diving has caused much sinus trouble. Pus and poisons from infected sinuses may spread to other parts of the body. Infected sinuses are common in some parts of the country. Unless they are treated by a doctor, they are likely to continue to cause pain and to lower resistance to other diseases.

Look carefully at the drawings on page 99 and this page and then answer these questions: Why should you blow the nose without pinching it shut? Why should you always blow the nose gently?

What do you think is the cause of your colds? Some people say, "I caught my cold sitting in a draft," or, "This changeable weather is bad for colds," or, "I got overheated and caught cold." Doctors say that chilling of the body, sudden cooling after exercise, or wearing wet shoes and clothing may bring on a cold. During the fall and early spring months children in country schools in the north, on their way to school, frequently get their shoes, stockings, and outer clothes soaking wet. Some teachers stretch a line across the back of the schoolroom on which the children hang their wet clothing to dry. This is a wise thing to do.

But cold and dampness do not cause colds unless germs are present. This fact is proved by the experience of the arctic explorers who had no colds when they were living amid ice and snow, but got bad colds as soon as they returned to towns and cities where a large number of people had colds.

Some people say, "I got my cold last night sitting in a hot, stuffy room." This might have been partly true. When the temperature of an artificially heated room rises above 68° F., the air usually becomes drier. As the air of the room becomes drier, the lining of the nose and throat loses its natural moisture. You remember that the moist mucous membrane catches bacteria, in much the same way that flies are caught on flypaper. The mucus also helps to wash bacteria out of the nose and throat. The dry air thus gives bacteria a better chance of lodging in the nose and throat.

A number of people say, "If I stay up late and become very tired, I'm almost sure to catch cold." Physicians agree with this. Fatigue often paves the way for a bad cold.

In big cities many people blame the dust and smoke and soot in the air for their colds. The nose and throat may be irritated by dirty air. Far less progress has been made in securing pure air than in securing safe water. The air of large towns and cities contains gases of various kinds and dust. The dust may not only be harmful to lung tissue and carry some bacteria, but it may also shut off the *ultraviolet light* * of the sun, which is important for health. Many engineers are working on the problem of securing pure air for our cities, and a little progress is being made.

"You should sleep with your windows open, and then you will not have so many colds," you have heard people say. But some people who always sleep with their windows wide open winter and summer have colds. A college physician said: "Cold air at night is not good for all people, but there should always be a circulation of air in the room. In general, cold air helps to prevent but certainly is not a cure for colds."

Smoking a pack of cigarettes a day irritates the mucous membrane of the throat and lungs. This daily irritation may lead to cancer of the lungs.

Exercise out of doors is usually considered a preventive of colds, though it was found at Cornell University that students who exercised a good deal had more colds than those who did not. This was probably due to carelessness in taking showers and wearing warm, dry clothing after the vigorous exercise. Athletes are not free from colds, but moderate exercise out of doors in the sunlight is a good preventive of colds.

"No wonder the young girls have colds," some older folk say. "They wear such thin underwear and have their necks bare." To be sure, clothing is important and should be suited to the weather. One should be comfortably warm at all times. But one can have "too much of a good thing," and most authorities agree that wrapping the body in three or four thicknesses of woolen clothing will not prevent colds. Too much clothing makes a person perspire; as the perspiration evaporates, the body may become chilled. If the skin capillaries are

OUTDOOR GAMES HELP BUILD RESISTANCE TO COLDS.

kept well toned by sun baths, cold-air baths, or cold-water baths, they will respond promptly and effectively to changes of temperature. You will not then feel so chilly in cold air. You will be comfortable with less clothing.

Very few people try to trace their colds to the food they eat. Have you ever heard anyone say, "I caught cold because I ate so much candy this week"? Yet there is evidence that food is important. People who have plenty of milk, butter, fruit, and vegetables usually get over their colds quickly.

Some doctors think that constipation and colds go together, and they ask their patients, "Have you been having regular bowel movements?" The protective foods, fruit and vegetables, help to prevent constipation and increase resistance to colds.

Still less often do people think, "I caught cold this week because I got angry and upset." Yet being angry and worried may lead to colds as often as sitting in a draft. We do not know; we need more knowledge about the effects of anger, fear, and worry on health.

Probably the most common comments that you hear are these: "Brother came home with a cold, and now everyone in the family has it." "I know I caught my cold in the streetcar yesterday when everyone around me was sneezing. One man sneezed right down on me." "Jane came to school with a cold, and now many of the other boys and girls in the class have colds." Colds are easily passed from one person to another.

We now know that colds are caused by some living *microorganisms.** We used to think that colds were caused by the bacteria usually present in one's nose and throat and that these always-present germs caused colds when the person's resistance to them was lowered by fatigue, chilling, indigestion, and other factors. Then we thought that colds were caused by some less common bacteria that were especially harmful to the nose and throat. It is now practically certain, however, that most colds are caused by *viruses,** *organisms* * so much smaller than ordinary bacteria that they cannot be seen under the ordinary microscope. The virus causes the cold, and then the common nose and throat bacteria come into the picture and cause complications. Any of these microorganisms may be spread from one person to another by careless sneezing, coughing, spitting, and blowing the nose. Colds are especially numerous in the fall and in the late winter and early spring.

Tonsils and adenoids sometimes furnish good board and lodging for the microorganisms that cause colds. Sometimes children seem to be freed from further colds by removal of diseased tonsils and adenoids. In other cases children still have colds even after tonsils and adenoids have been removed. Even though removal of tonsils and adenoids does not free children from colds, these foci of infection should be removed if necessary, because they may be dangerous in other ways. Look at the diagram on page 99 and show how bacteria, breeding in diseased tonsils or adenoids, may spread to nose, throat, and ears. Poisons from bacteria in tonsils may be carried by the blood to the heart and other organs.

YOUR RESPONSIBILITY FOR CHECKING COLDS

"Well," someone asks, "what can a person do when there is so much disagreement as to why people have colds?" There is some truth in all these opinions you have just read; it is best to pay attention to all of them.

1. *Don't get chilled.* Even though sudden chilling of the body is not proved to be a cause of colds, it is wise to think of the weather when dressing, so that you will be just warm enough at all times. It is wise to take off wet clothes and shoes promptly; to put on a warm sweater after exercising; to avoid sitting in drafts; and to train the capillaries of the skin by air, water, and sun baths to respond quickly to changes in temperatures.

2. *Get your share of exercise and fresh air.* Even though athletes catch colds just like other people, it is wise to take regular, moderate outdoor exercise every day. It is wise to get direct sunlight on some part of the body every day of the year when the sun shines.

Even though fresh air alone cannot prevent colds, it is wise to have some circulation of air in your bedroom and to keep the rooms where you live supplied with fresh outdoor air at a temperature of about 68° F. and as free from dust as possible.

A poorly ventilated room is usually too warm. It sometimes has a close, unpleasant odor. You often begin to feel drowsy and tired when working in such a room. There are usually slightly less oxygen and slightly more carbon dioxide in the air of a poorly ventilated room than in the air of a well-ventilated room. Oxygen, as you know, is necessary for life. We inhale oxygen in the air. Some of the oxygen is used by our bodies, and the carbon dioxide that we exhale is then formed. The amount of carbon dioxide in an ordinary room is harmless. (Carbon dioxide is not the same as *carbon monoxide.** Carbon monoxide is very poisonous. It has no odor and causes death quickly. Carbon monoxide is always formed when the engine of an automobile is running. People should always open the garage doors before they start the automobile engine and should not sit in a closed car with the engine running.)

Overheated rooms cause more trouble than the carbon dioxide in rooms. If you keep the temperature of a room between 65° and 68° F., you are doing a good deal toward having it well ventilated. Several years ago an experiment was tried in two classrooms. In one the temperature was kept about 68° F. In the other room the temperature was above 70° F. The children in the cooler room had fewer colds and better appetites than the children in the warmer room. They felt more like working, too. In another experiment men did 15 per cent less work when the temperature of the room was 75° and 28 per cent less work when it was 86° than when it was 68°. The cooler air is usually not so dry as the hotter air. Air that is very dry is unhealthful, as you have already learned.

One good way to ventilate a room is to open the windows at the top and bottom. Another good way is to have a window board that sends the cold air upward as it comes in, so that it does not blow directly on you. An outlet on the inner wall of the room near the ceiling will draw off the warmer used air. Sometimes a screen is placed in front of the window so that the fresh air gets warm before it reaches you.

The best air is clean, fresh air from out of doors, heated to about 68° F. If we keep the room at the right temperature, we need not bother about the humidity.

Ultraviolet light has been used to free the air of rooms from germs. The number of bacteria in the air of school rooms and hospitals has been reduced by ultraviolet light. Its effect on the smallest known germs the viruses is still being studied.

Experiments have shown that germs floating in the air of a room may be killed by using a *glycol** spray. This is odorless and seems to be harmless to human beings. It acts almost like magic. Through experiment it was found that when glycol was sprayed properly, the number of germs in the air was reduced by more than 97 per cent. But both the glycol spray and the ultraviolet light need to be tested further to justify the expense of providing them for use in schoolrooms.

3. *Get your share of sleep and rest.* It does not pay to "burn the candle at both ends"—to allow fatigue to pile up, even though fatigue is not the only reason why people catch colds.

4. *No smoking or drinking!* Even though many people who smoke have no more colds than those who do not smoke, it is not wise to irritate the delicate lining of the nose and throat unnecessarily.

Animal experiments have strengthened the general impression that the use of alcohol tends to lower resistance to infection. One scientist has shown that animals that were given even small doses of alcohol over a long period of time caught *communicable* * diseases oftener than similar animals that were not given any alcohol, though they did not die more frequently. That is, they did not have a higher death rate. Animals that were given large doses of alcohol and then were given disease-producing bacteria showed a greater *susceptibility* * to infection and a higher death rate than did a similar group of animals which were given the same kind and number of bacteria but received no alcohol.

Physicians generally consider the *chronic* * alcoholic—one who habitually uses alcoholic drinks—more susceptible to pneumonia than the average person and more likely to die if he catches that disease.

5. *Get your share of vitamins.* Even though adding vitamin A to the diet does not always prevent colds, a good diet helps to build a good body. A good body recovers more quickly from sickness of any kind. Everyone agrees that it is wise to include in the daily diet generous amounts of fruits and vegetables; milk, and butter, which furnish vitamins. Vitamin pills help some persons.

6. *Stop the spread of germs.* Even though the special microorganism that causes colds cannot always be found, we know that it exists. Therefore keep away from people who are carelessly coughing and sneezing. Cover your own nose and mouth when you have to sneeze or cough. It is also wise to keep your fingers out of your mouth, to keep your hands clean, and to stay in bed when you have a cold. It is wiser to play out of doors than to go to the movies and to mix with crowds in other shut-in places at times when colds are common.

7. *Get rid of foci of infection.* Even though the removal of diseased adenoids, tonsils, and other foci of infection does not always free the individual from colds,

it is wise to have these foci of infection removed whenever the physician advises their removal.

8. *Build resistance by better health habits when you are well and when you are sick.* Even though everyone is not agreed that good general health will increase your resistance to germs and prevent your catching colds, practicing the essential everyday health habits is a fine investment to make. If you catch a cold, do not neglect it. Resting in bed; eating wholesome, easily digested foods, such as fruit, milk, custard, plain lettuce salad, and buttered green vegetables; drinking plenty of water; and taking a laxative medicine, if necessary, are the best steps to take in treating colds.

9. *Let your doctor prescribe medicine; don't doctor yourself.* There are a large number of patent medicines and so-called cures for colds and coughs. Some are really laxatives or cathartics. A good many *gargles,** mouth-

washes, sprays, nose drops, cough drops, and cough medicines are advertised to "cure" the irritation of the nose and throat. If you read the directions carefully, you often find that these "remedies" are to be taken in water and that you should drink fruit juices and rest in bed. These simple, sensible health rules often cure the cold without your having to buy and take any medicines.

Your own doctor may advise you to use certain sprays or nose drops, but you should not buy them just because you see them advertised. Some do little good; some are harmful. (See page 117 for a discussion of sprays and nose drops.) A gargle made by putting a half teaspoonful of salt and a quarter teaspoonful of baking soda in a glass of hot water may make your throat feel better.

Some medicines that at first seem to be "miracle medicines" later prove to be disappointing. For example, *anti-histamines** were at first thought to be a cure for colds. But careful studies have shown that they are of little use in preventing or curing a cold.

10. *Use clean, dry handkerchiefs and take care of cold sores.* One of the unpleasant things about having a cold is that the skin and mucous membrane around your running nose become sore. In cold weather they are likely to chap. To prevent soreness and chapping, blot your nose and upper lip dry each time you use your handkerchief. A wet handkerchief spreads bacteria and will not dry the skin. Either use plenty of fresh, dry cloth handkerchiefs or use paper ones that can be thrown away. Cold cream or petrolatum (vaseline) protects your skin and helps the sore places to heal. Use it before you go outdoors and before you go to bed.

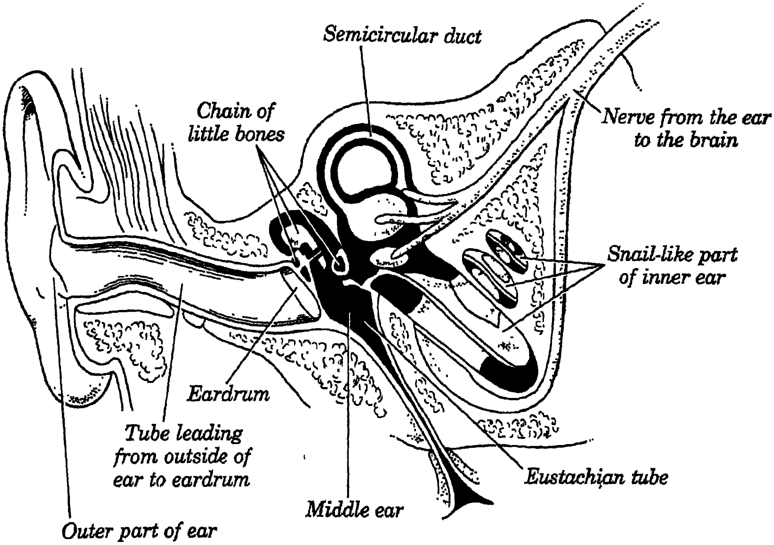
Cold sores, or fever blisters, often follow infections of the nose or throat. Usually you notice first a sudden burning sensation on the lip or at the corner of your mouth. A blister or a group of small blisters soon develops. Do not break the top of the blisters. Heat or cold may ease them. To dry them, alcohol or *camphor* * may be used. Some people find that they have few cold sores if they are careful to avoid picking or pulling the dry skin which sometimes forms on the lips during a cold. Why should you not pull this dry skin loose?

Perhaps you have very few colds. Colds do not seem to run in some families or to bother short, stocky, happy-go-lucky people so much as tall, thin, nervous people. But perhaps colds are one of your big health problems and also one of your father's and mother's health problems. If they are, it is wise for you to do the things to prevent colds that have been mentioned. If you faithfully do all these things and still have colds, your physician may decide to *inoculate* * you every winter for several years against the germs that are growing in your nose and throat. Inoculation against colds is still in the experimental stage, but it is worth trying even now.

It is also interesting to watch for new discoveries about colds. From time to time you will find articles on colds in newspapers and magazines. Thousands of dollars are being spent in trying to find new facts that will help people to prevent some of the discomfort and loss in time and money caused by the "common cold."

THE EARS AND THEIR CARE

What is it that you hear? You will answer, "Sounds." But what is sound? Sound is caused by motion in the air. Have you ever thrown a pebble into the water and watched the circles of ripples spread wider and wider? When you blow a horn, you make air ripples. These air ripples spread wider and wider. When they reach a


Semicircular duct
Chain of little bones
Nerve from the ear to the brain
Snail-like part of inner ear
Eardrum
Tube leading from outside of ear to eardrum
Eustachian tube
Middle ear
Outer part of ear

INSIDE THE EAR

In what two ways can bacteria reach the middle ear?

person, they cause his *eardrums* * to vibrate in the same way. The effect of the vibrations is transmitted to his brain, and he hears the sound of the horn. The healthy, uninjured eardrum, then, is very important for hearing well.

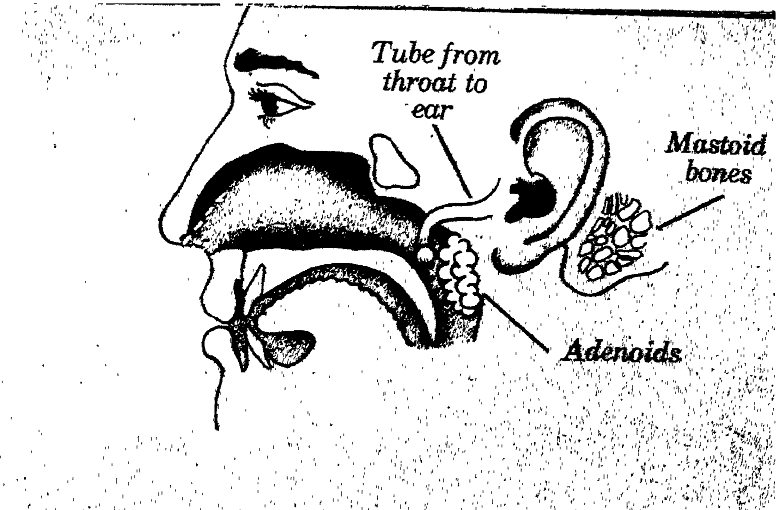
Pain or a "stuffy" feeling in the ears is usually caused by infection behind the eardrum. (See drawing above.) The eardrum is a thin membrane somewhat like the material stretched across the end of a drum that you beat. It is covered on the outer side with skin and on the inner side by mucous membrane similar to that which lines the nose.

If bacteria get into the space behind the eardrum, pus is likely to collect there and press against the drum. If the pressure becomes great, the pain is severe and the eardrum may be broken (ruptured). If the eardrum has been ruptured, it may heal up again, but if it does not, it will leave a small hole through which infection may creep into the ear. People who swim should have their ears examined. If the eardrum is punctured, care should be taken not to get water into the ears during swimming, because the water in swimming places may contain dangerous bacteria. About 25 per cent of adults have had their eardrums ruptured at some time.

Ear infection or loss of hearing sometimes follows scarlet fever and other children's diseases or results from a cold. After a person has recovered from one of these diseases or a cold, it may be wise to have his hearing tested.

Bacteria may travel through the ear or up the passage between the throat and the middle ear to the *mastoid* * bones. You can feel these mastoids as hard bones just back of your outer ear. These bones are porous and spongelike. If they become infected, pus forms in the little hollow spaces. Since the mastoids are so near the brain, infection may be very serious. An *operation* * may be necessary. The new drugs such as the *sulfonamides* * and *penicillin* * have made mastoid operations necessary much less frequently.

The ears should be washed with soap and water every day. Do not try to go deeper into the canal than you can reach by covering the tip of your finger with a damp cloth and gently cleaning the canal. Do not pick at the wax with a sharp instrument. If the wax has gathered in the ear and hardened, let the doctor remove it. When you play, avoid striking anyone across the ear. You might break the eardrum. Have your hearing tested. If you have any trouble in hearing or any pain in the ear, go to the doctor at once.



Germs from the nose and mouth sometimes pass through the tube to the ear and then to the mastoids.

Use a *nose douche* * only on the advice of a physician. A nose douche is sometimes used to wash out the nose cavity with an *antiseptic* * solution. But, unless a douche is used carefully, it can easily do more harm than good by forcing bacteria farther into the throat, ear passages, and sinuses. In these places bacteria may do far more damage than in the nose.

Oily nose drops, if misused, have been known to lead to pneumonia, especially in babies or young children. The tiny drops may reach the lungs, irritate them, and give the pneumonia germs a fine chance to grow. Unless your doctor advises the use of oily nose drops and tells you just how to use them, it is better to avoid them.

PROBLEMS TO SOLVE

1. *If you are small for your age and cannot run as fast or play basketball as well as the others,* what can

you do to feel happy and successful? Which of these might be a good solution and why?

a. Become very quick and skillful in some game or sport you can learn to do well such as diving and swimming, handball or tennis, golf.

b. Become a good team manager or photographer.

c. Spend your time in reading instead of in outdoor activities.

d. Say, "Those big athletes are dumb; all they have is muscle."

e. Think, "Nobody would want to play with a little runt like me."

f. Notice the body build of different leaders of your class.

g. Buy a book on body building, with pictures of men with large muscles.

h. Take deep-breathing exercises every morning and night.

2. *If you have been having four or five colds* during the winter, what can you do to have a better record? Why is the problem important to you? How did you catch a cold in the past? How can you build up resistance? How can you avoid people who have colds? What can you do to be more cheerul and happy?

3. *If you, or your small brother or sister, breathe through the mouth,* what should be done about it? What might be some of the causes of mouth breathing? How can you find out what is the cause in your case?

4. *Suppose your father comes home from work with a bad cold.* What can you do (a) to make him more comfortable, (b) to help him get over his cold as quickly as possible, and (c) to prevent other members of the family from catching the cold? Which of these would be the best things for him to do?

a. Take a cold medicine and look at TV.

b. Drink lots of water and a glass or two of fruit juice, go to bed and have a simple, easily digested supper.

5. *If your rooms at home or at school are poorly ventilated.* Why is this an important problem? What should you do about the temperature? What can you do if a good deal of smoke and dust is in the city air?

6. *How can you avoid ear trouble?* Why is this important? What facts about the nose, throat, and ears show you that these health rules are important:

Blow your nose gently; hold your handkerchief close to your nostrils, not tight against them.

Clean your ears gently.

Try to keep from catching cold.

Protect your ears from blows, loud noises, sharp objects.

If your ears feel stuffy or if there is a discharge from an ear be sure to see your doctor.

7. *How does an athlete get "good wind"?* How does exercise affect breathing at first? After you have been exercising regularly? As the muscles that move the ribs grow stronger and you breathe more deeply, how does that affect your rate of breathing?

WHAT IS YOUR SCORE?

Rule a sheet of paper into three columns. In the first column write as many numbers as there are statements here and on page 120. In the second column put a plus sign for No. 1 if you think No. 1 is correct. If you think No. 1 is not correct, put a minus sign in the third column. Write a plus or a minus sign in the proper column for each of the other statements. Ask your teacher to read the correct statements. What is your score? Choose one statement and write a paragraph about it.

1. Colds are the most common cause of absences from school and from work.

2. *Respiration* means *breathing in air.*

3. Your nose acts as an air-conditioning system by helping to regulate the warmth, moisture, and amount of dust and bacteria in air that you breathe.

4. There is a small surface inside the lungs for the exchange of oxygen and carbon dioxide.

5. The only time the blood carries more oxygen than is necessary at the moment is when you exercise vigorously.

6. There is less oxygen in the air at high altitudes.

7. A high humidity in the air means that the air is dry.

8. Coughing serves no useful purpose.

9. Blowing your nose hard helps to clear mucus from the sinuses and is a safe thing to do.

10. Cold and dampness always cause colds.

11. Doctors have found the germ that causes colds and have a sure cure for colds.

12. Since removing the tonsils and adenoids does not always prevent colds, operations for the removal of tonsils and adenoids should not be performed.

13. Increasing resistance seems to help prevent colds.

14. Rest in bed is one of the best remedies for a cold.

15. Persons whose eardrums are ruptured should guard against infections of the ear, especially when they go swimming.

16. Nose douches are necessary.

17. Alcohol decreases susceptibility to colds.

18. To prevent colds and improve health, stay in rooms heated to 70° F. or higher.

INTERESTING BOOKS

FITZPATRICK and BAIN—*Living Things,* pp. 232-236, 248-250.

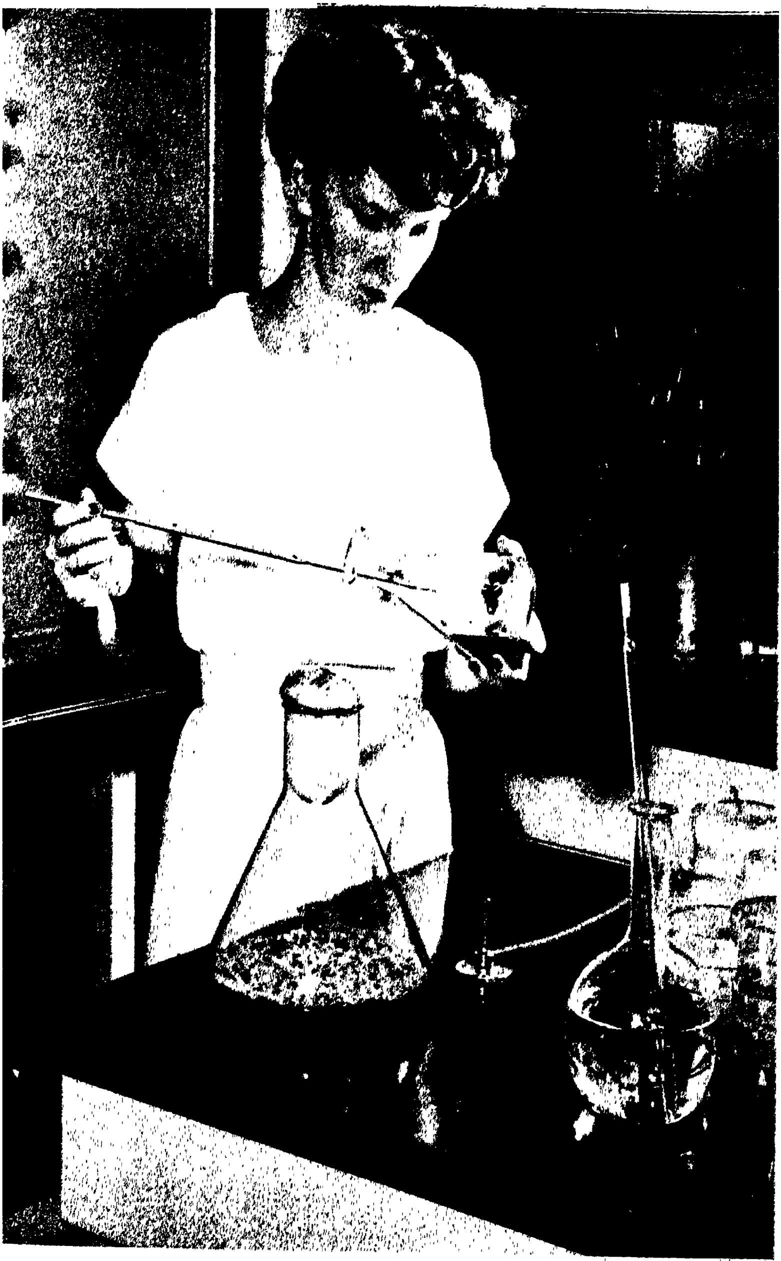
MEISTER, KEIRSTEAD, and SHOEMAKER—*The Wonder World of Science,* Book VII, pp. 45-60, 161-188.

NATIONAL TUBERCULOSIS ASSOCIATION—*Your Baby.*

NATIONAL TUBERCULOSIS ASSOCIATION in co-operation with the INTERNATIONAL FOUNDATION FOR VISUAL EDUCATION—*Basic Facts in Picture Language*

OLESON—*Common Colds*

PARKER and DOWNING—*How We Are Built*



This scientist is making a penicillin culture.

THE EYES AND HOW THEY WORK

On pages 114-115 you read that the ear is so constructed as to catch and transmit to the brain certain air ripples or waves that we call *sound vibrations*. There are other very much faster vibrations that we call *light vibrations*. Light vibrations travel through space very rapidly. Light vibrations travel 186,000 miles a second, a speed equal to that of the radio waves. A ray of light can travel fast enough to go seven times around the earth in a second. Light rays from the moon can reach the earth in about a second and a quarter. The eye is constructed so as to receive light vibrations and transmit them to the brain. Then we say, "There is light."

Have you ever been to an *oculist* * or to an *optometrist**? An oculist is a doctor who has learned a great deal about the health of the eyes and of the body as a whole. An optometrist is skillful in measuring the eyes and testing their vision. Both can fit the eyes with eyeglasses. In making an eye examination the examiner usually first places a chart with letters of different sizes twenty feet away from you. You begin reading the largest letters and continue to read to the line of smallest letters that you can see. If at a distance of twenty feet you can read only letters that the normal eye can see at a distance of forty feet, your vision is said to be $\frac{20}{40}$—that is, about half of normal. What would a record of $\frac{20}{30}$ mean?

If the examiner discovers that your vision is seriously below normal, he carefully tries a number of different glasses—*lenses,** as they are called—for each eye. When he has put a lens in the frame on your nose, he asks, "Is this better or worse?" Sometimes you find it hard to decide whether the lens makes the letters more distinct or not. But you judge each lens as well as you can. Finally a lens is found for each eye that enables you to read readily the line of letters that the average person with good eyes and without lenses can read twenty feet away.

Like the heart and the kidneys, the eyes do a tremendous amount of work. Some people read or write or type for eight hours a day at their work. Then they read several hours more for recreation. Little children should not be allowed to use their eyes in close work for such long periods. Adults can usually work long hours and still keeep the eyes in good condition if they take good care of them.

Boys and girls have asked the following questions about the eyes. How many can you answer?

How often should the eyes be tested? To what kind of doctor should you go for an eye examination?

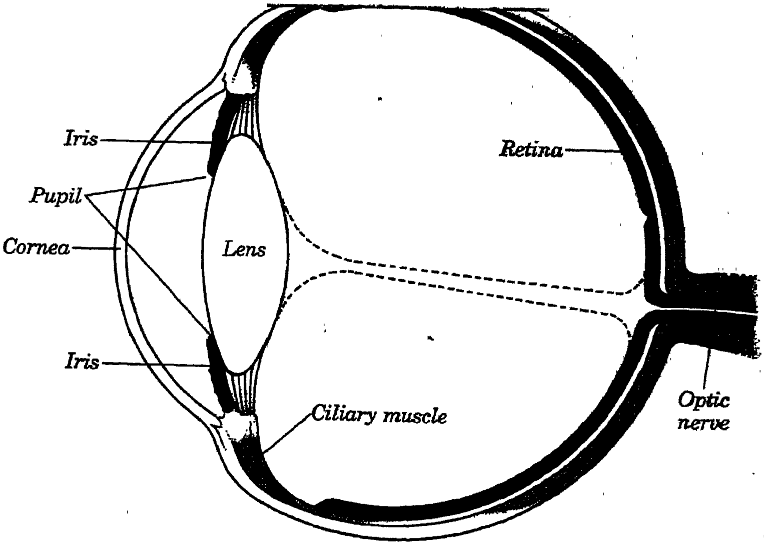
Does $\frac{20}{30}$ on your health examination card mean that you have poor eyes?

What causes weak eyes? Can weak eyes be strengthened without glasses? Does washing the eyes with *boric acid* * strengthen them?

How can you tell whether glasses are necessary? Are glasses necessary to relieve strain? Will wearing glasses make your eyes weaker? Do glasses restore eyesight?

What is the difference between *nearsightedness* * and *farsightedness* * ? What causes each condition? Can nearsightedness be cured? What is blindness? How is it caused?

Do movies and TV harm the eyes? Is reading in bed harmful? Why should one read with his back to the light? Does reading two hours a day harm the eyes? How far should you hold a book from the eyes? What makes the eyes hurt when you are reading?



A CROSS SECTION THROUGH THE EYE
Find the *pupil,** cornea, *iris,** lens, and retina.

What causes bloodshot eyes? Red eyelids? How may *sties* * and *pinkeye* * be prevented?

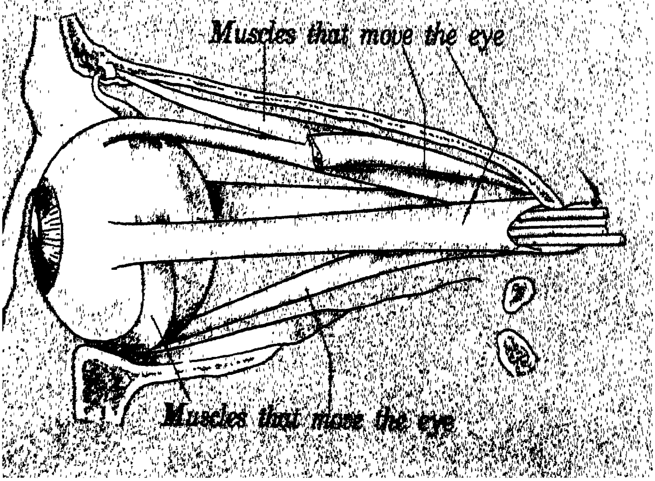
A few of these questions have been answered already. In order to answer some of the others, you should have a little more information about the structure of the eye.

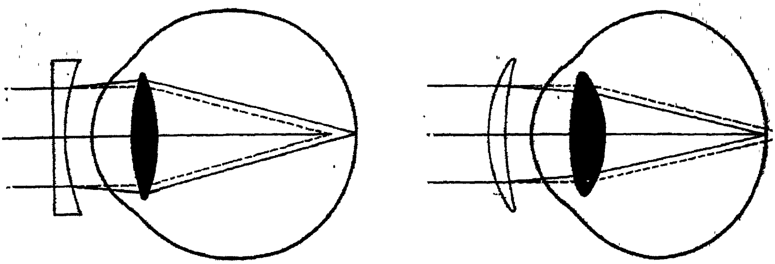
The structure of the eye is shown in the picture on this page. Study the picture carefully. If you are to see the print that you are now reading, the rays of light must bend so that they will be brought to one point on the *retina.** There an image of the printed line is formed. This is done chiefly by the lens and the *cornea.**

The rays of light from the object at which you are looking not only need to be brought to a point, or *focus,** but they must also be brought to a point on the retina. If the focus falls in front of, or back of, the retina, the picture is indistinct. The focusing of the same image on the retina of both eyes is accomplished by the small *ciliary muscles* * and by the three pairs of external muscles of the eyes (find them on this page). The external muscles of the eyes can turn the eyeball upward, downward, or sideways.

The retina is a network of nerves and nerve endings. Images of the things we see are focused on it. It is joined to the *optic nerve,** which carries the sensation to the brain. The rays of light from objects more than twenty feet away will, in a normal eye, come to a point almost exactly on the retina. Little changing of the parts of the eye is necessary therefore when you are looking at objects more than twenty feet away. How far away from your eyes are you holding your book now? Look out of the window at the sky for a moment. Then begin to read again. When you looked from the sky to your book, the ciliary muscles contracted and the lenses became more rounded—more *convex,** that is, curved somewhat like

WHICH OF THESE MUSCLES MOVE THE EYEBALL UPWARD? DOWNWARD? SIDEWAYS?





Near sighted
(Myopic)

Far sighted
(Hypermetropic)

THE DOTTED LINES SHOW THE PATHS OF RAYS ENTERING THE EYES WHEN GLASSES ARE NOT WORN; THE SOLID LINES, OF RAYS PASSING THROUGH GLASSES CORRECTING THE DEFECTS.

a marble. The external muscles of the eyes also caused the eyeballs to turn slightly inward so that the pupils were nearer together.

What is the difference between nearsightedness and farsightedness? Nearsightedness, or shortsightedness, as it is also called, may be caused by an eyeball that is too long. Instead of coming to a point on the retina, the rays of light from the object come together before they reach the retina. Suitable *concave* * glasses prescribed after a careful examination has been made will focus the rays on the retina, thus permitting a clear image.

The eyeball may grow longer than it ought to be because it is given too much close work, such as reading. Nearsightedness is more likely to occur if at the same time the child is not eating the kind and amount of food that furnish the nourishment needed by all parts of the eye. For the *conservation* * of eyesight good diet and good general health are important.

There are two kinds of nearsightedness, the ordinary and the progressive kinds. Ernest H. Starling, an English physiologist, says of the progressive kind: "The treatment of *myopia* * [nearsightedness] is, therefore, not only the wearing of spectacles, but the absolute prohibition of near work or close study, the administration of extra-nourishing food, and an open-air life for a year or more. If these steps are taken at once, the myopia may get no worse, and may in fact get better. But if neglected, the condition will almost certainly get worse. . . . Glasses should always be prescribed and care taken that the child wears then constantly." [1]

Farsightedness, or longsightedness, may be caused by an eyeball that is too short. The rays of light from an object, in such an eye, come together beyond the retina. Then there is an indistinct image. The diagrams on page 125 make the difference between nearsightedness and farsightedness quite clear.

Astigmatism * is another common type of defect that can be discovered by careful examination and corrected by wearing glasses. Astigmatism occurs when one part of the front portion of the eyeball, the cornea, or the lens is curved more like the bowl of a spoon than like the surface of a ball. The result is that all the rays of light from the whole object are not brought to a point on the retina at the same time. The object accordingly looks blurred.

"Cross-eye," or "squint-eye," results when the muscles that move the two eyes do not work together. Early treatment will correct this defect. If one eye has better vision than the other, the stronger eye will do most of the work. The other eye will become lazy and will tend to turn inward or outward. Glasses suited to the eyes will often cause the lazy eye to begin to work. In addition to glasses, eye exercises are provided to train the weaker eye. Little children enjoy the pictures of Santa Claus and animals that are often used for this purpose. Drawing simple copies of pictures is also helpful. If this condition is not soon corrected by training methods and by glasses, a fairly simple and not dangerous *surgical* * operation is necessary.

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[1] *Principles of Human Physiology*, page 537; Lea and Febiger.

So-called "weak eyes" come usually from one of the four conditions just mentioned—nearsightedness, farsightedness, astigmatism, or muscle weakness. You have seen that each one is due to some defect in the structure of the eye. In the first three cases, the defect can be overcome by wearing a kind of lens that will bring the rays of light to a focus on the retina. If glasses are not worn, the muscles of the eyes are under a strain whenever the eyes are used for close work.

Does boric acid strengthen the eyes? Boric acid may wash away some of the dust and bacteria from the eyes. It may also kill certain bacteria. But an eyewash of any kind is rarely necessary because the eye itself makes its own eyewash, which it uses in small amounts all the time and in large amounts when there is something irritating in the eye. The tears that flow when you get something in your eye not only wash the eyeball but also have power to kill some germs. An eyewash will not strengthen the eyes. There are some eyewashes that may be harmful. Some expensive eyewashes are nothing more than boric acid with another name and a higher price mark.

In case you do use an eyewash, use a clean medicine dropper, not an eyecup. The eyecup may not be clean. Dirt and bacteria on the eyelashes and skin around the eye get into the liquid in the cup and might cause infection. Infection may be spread from one eye into the other.

What causes blindness? Blindness may result from many causes. One of the commonest causes of unnecessary blindness is a disease often called "babies' sore eyes." Blindness from this disease can nearly always be prevented by proper treatment of the eyes of the new-born and young baby. Other communicable diseases of the eyes may cause blindness. *Trachoma* * is a very serious disease of the eyelids which is easily transferred from one person to another by a common towel. *Measles* * and scarlet fever sometimes are followed by defective vision.

A great deal of blindness is due to accidents, such as letting the branch of a tree snap back into the face of a person walking behind you; allowing a knife or other sharp object that you are handling in a careless way to slip; not looking where you are throwing sticks, stones, baseballs, and snowballs; and careless handling of guns and air rifles.

Careless use of the eyes is a too frequent cause of failing sight. Any condition causing redness of the eyes should be carefully investigated by a doctor if possible. The cause may be dust or grit in the eye, eyestrain, too much sunshine, or infection.

YOUR RESPONSIBILITY FOR YOUR EYES

1. *Have your eyes examined at least once every two years.* You may have eye defects without knowing it. Slight defects of vision, if discovered early, can often be corrected. Sometimes signs of eyestrain are shown, not by pain or irritation of the eyes, but by headaches, indigestion, or pain in other parts of the body. Not liking to read

BEFORE GLASSES AFTER GLASSES

This boy needed glasses. What difference do you think wearing glasses made in the way he felt, the way he looked, and his success in schoolwork and in games?

interesting stories may be a sign of an eye defect. Not being able to hit the ball when you are playing baseball or tennis may be a sign of poor vision.

Glasses made to suit your eyes help to overcome defects in the eyes and defects in vision and to prevent eyestrain. You should have your eyes examined if you have any of the following signs of possible eyestrain: continually holding the book you are reading less than twelve inches from your eyes; frequent headaches; blurring of the print when you are reading; scowling or squinting when reading or sewing; difficulty in reading words and numbers on the blackboard; slowness and difficulty in studying your lessons; sties; crusts on the lids; twitching of lids; red and inflamed eyelids; bloodshot eyes.

2. *Wear glasses if you need them.* You should follow directions regarding glasses. Some people dislike to wear glasses because they think that glasses spoil their good

looks. But red, watery eyes, wrinkles, squinting, and other signs of eyestrain are less attractive than glasses.

After you have had a pair of glasses made, you should keep them carefully adjusted to your eyes. Glasses must fit properly. It is a good plan to go back every few months to the *optician* * from whom you bought your glasses and have them readjusted, because the frames easily become bent and slightly out of shape. A reliable optician, after he has made your glasses, will usually say, "Drop in again in a month or two and let me see if the glasses are still properly adjusted." Glasses are ground with great care. If the frame is twisted or the glass has become shifted in the frame, the corrective work that the glasses were intended to do will be undone. In fact, more harm than good may be done by wearing glasses that are improperly fitted or adjusted.

It pays to take care of your glasses, for you will then have better use of them and they will be more comfortable. You will also save the trouble and expense of replacing broken lenses. Jerking glasses off and on soon twists the frames and may loosen the tiny screws that fasten the frames and lenses together. If you wear glasses that do not have a frame all around each lens, you should be especially careful not to crack or break the lenses. A fall may crack or break any kind of glasses.

If you wear glasses, what do you do with them when you take them off? Do you lay them down so that the lenses might be scratched? Many people do. The safest place for them whenever they are not on your nose is in their own case. Put the case where it will not be likely to be pushed off and the glasses broken. Sometimes people lay their glasses down on a table or even on a chair. It is easy to forget they are there. Some other person may not see them and may lay a book over them or may catch them and pull them off the table. The owner of the glasses may also forget about them and break them.

Those who wear glasses only part of the time need a deep pocket to carry the case. If the pocket has a flap you can button, the case is not so likely to fall out. Keep the lining of the case free of any grit or dust.

Glasses need to be cleaned at least once each day. A special kind of soft polishing cloth may be used. Watch how the man who adjusts your glasses holds them when he cleans them. He probably holds them by the part of the frame that fits over the nose. He is careful not to twist the frame. Dirty glasses put on so that one lens is higher than the other or nearer one eye than the other are worse that none at all. If your glasses are clean and fit well, people hardly notice that you are wearing glasses.

3. *Hold your work properly at a good distance for reading.* Hold the book or other object at least twelve inches from the eyes. If the book is held too close to the eyes, the pupils of the eyes must be turned toward each other by the eye muscles. The result is an unnecessary strain and fatigue of the eye muscles. Can you explain why? There is also the possible danger of getting "cross-eyed" by holding a book too close to the eyes. Can you explain why looking into the distance after you have been reading for some time rests the eyes?

4. *Choose books that are easy on the eyes.* The books you read should have easily read, black print on dull—not glossy—paper.

5. *Don't strain or overwork your eyes.* At birth the eyeball is a little too small for the rest of the *visual* * system, but it grows until it reaches the normal size. If a child uses his eyes too much for near work, the eye-

ball may go on increasing in length and bring about nearsightedness. It is very important to discover the beginnings of nearsightedness and to give the eyes a rest from close work at that time.

Avoid reading while lying down. When you are reading lying down, the head is held in an unnaturally low position. There is additional strain on the eye muscles when they are used in an unnatural position. The book is often too near the eyes, and it is usually difficult to arrange the light in the best position. Even the bed lamps now sold may not solve the problem satisfactorily. It is especially undesirable for children to read after they have gone to bed at night because they are likely to lose sleep as well as to strain the eyes.

You should avoid steady reading on trains or looking at rapidly moving objects for a long time. There is such a continuous rapid adjustment needed in reading fine print on moving trains that the strain is soon felt. Headache and dizziness sometimes result.

Modern motion pictures and theaters are much improved over the old-fashioned ones; yet headache and eyestrain sometimes follow a long program. This is particularly true if you sit far down toward the front or so far to one side that the pictures look blurred and out of focus. Boys and girls who wear glasses usually need them for movies. The same thing is true of television. Viewing television is a real strain on the eyes if:

the eyes are already tired from reading,
you do not sit 8 to 10 feet away from the screen,
the screen is not on eye level,
you view it too long,
you are not sitting directly in front of the screen.

There are several things a person can do to rest his eyes:

1. Close the eyes quite often during a period of reading or close eye work.
2. Look often at far-off earth or sky.
3. Blink often, for blinking washes and rests the eyes.
4. Let your eyes travel over an object—don't stare at one spot. Keep the eyes moving.

6. *Secure the right kind and amount of light.* Light may be either insufficient or glaring. You have to guard against insufficient light on dark days and also at twilight, when the light fades so slowly that you do not notice that the room is becoming dark. Shadows often creep over the page of a book without your being conscious of them. Sometimes you "sit in your own light." Before you sit down to read or write, it is a good plan to notice whether or not the light is coming from behind your head and from above the level of your eyes. Why is this direction of the light desirable?

If you use electricity, you should have at least a 50- to 60-watt bulb for your reading lamp. A floor lamp placed to the left and a little back of your chair is more satisfactory for reading than a table lamp. The new study lamps built according to principles laid down by the Illuminating Engineering Society (I. E. S. lamps) are particularly good. If you use gas, you should have a burner that gives a white, steady light; do not try to get along with a flickering gas jet. The farther away you sit from the light by which you are working, the brighter the light must be.

There should not be too great a contrast between the light on your book and the light in the room. If you are reading at night, it is a good plan to turn on a little light in the room as well as in the lamp behind your chair. If you do this, the pupils of your eyes will not have to make so great a change as when you look from a dark room to a brightly lighted book.

A glaring light shining into the eyes is as annoying as shadows or too little light. When the light is bright, the pupil of the eye grows smaller just as the pupil of a cat's eye grows smaller when the cat comes from the dark into a bright room. By shutting out some of the bright light, the eye tries to protect the retina. But when the light is very bright, practically all of the light must be shut out so as not to injure the delicate retina. When there is a glaring light shining in your eyes from the page or some other source, the pupils of the eyes contract so tightly that you see less clearly than if the light were softer and the pupils were open wider.

Some of the newer homes have indirect lighting to prevent glare. But if you are careful to have a good reading light, such as you have just been reading about, you can have some of the advantages of indirect lighting without the expense of rewiring your home. Excellent reading lamps can be bought at rather low prices. It is important that no light bulb be exposed. If you can see part of the bulb beneath the edge of the shade or if the bulbs in an overhead fixture are not cut off from view, there is sure to be some glare. A practical test of a good light is comfort. If the person reads with comfort, the light is satisfactory for him.

For the past few years colored sunglasses have been a fad. They reduce the glare of sunlight and water. Not all sunglasses, however, are well made. Some let in so much light around the edges that they cause strain. Others make everything seem out of shape and may make your eyes hurt or give you a headache. Recent study of sunglasses has shown that good ones are not necessarily expensive. The glass in many cheap sunglasses is satisfactory. Before you buy sunglasses, be sure they are free from the faults mentioned.

Your regular glasses can be tinted to protect your eyes from glare. Or you can buy sunglasses that fit over your ordinary glasses.

Remember, too, that the colored glasses keep out only the ultraviolet rays. They do not protect your eyes from the sun's heat rays. For this reason you should never lie on your back looking up at the sun through colored glasses.

7. *Avoid alcoholic beverages and tobacco.* The overuse of alcohol has resulted in a shrinking of the nerve cells in the retina of the eye. Later the fibers of the optic nerve are affected in a similar way. When the optic nerve is seriously injured, blindness results. Though this kind of injury of the retina and optic nerve is generally considered to be most commonly the result of drinking wood alcohol, it is sometimes the result also of drinking grain alcohol—the kind of alcohol contained in beer, wine, whisky, and other alcoholic beverages. Usually, as a re-

sult of the alcohol, a general dimness of vision is first noted. This dimness increases rapidly. Even if the person stops drinking alcoholic beverages, permanent damage to the retina has very likely already been done.

Certain other defects of the eyes can be traced to alcohol and tobacco poisoning. Color blindness may develop from tobacco or alcohol poisoning in a relatively short space of time. A person who is color blind cannot recognize certain colors. He may not know, for example, whether he is wearing a red or a green necktie. Certain employees of railroads are tested for color blindness at regular intervals to be sure they can recognize the colored signals on the railway.

8. *Eat nourishing food.* The eyeball is richly supplied with blood vessels, which bring food to nourish the eye, just as blood vessels in other parts of the body bring food to nourish the muscles. If the outer coat of the eye —the "white of the eye," which you can see and which surrounds the eyeball—is poorly nourished, it may be pressed out of shape and the roundness of the eyeball may be destroyed. If this happens, what eye defect results?

A lack of vitamin A is shown very soon in an inflamed condition of the eyes. During a shortage of food children in Asia suffered from this disease of the eye. It was found that they could be cured by feeding them chicken livers, which are rich in vitamin A. In Europe cases of children suffering from this kind of eye trouble were cured by cod-liver oil, another excellent source of vitamin A. In parts of the far North there is a condition known as *night blindness,* which is thought to be due to lack of some food element, probably vitamin A.

The right kind and amount of food are essential to general health; improvement in general health usually results in improvement in eye health.

9. *Protect the eyes from germs and injury.* Keep hands, handkerchiefs, and other objects away from the eyes. These objects are likely to carry bacteria, which may produce redness, swelling, and pain in various parts of the eyes.

Germs that produce pus are common on the skin. Sometimes they get into the eye and cause "matter" to form. This thick, yellowish liquid gathers in the corners of the eyes. Dried matter and pus may make sharp-edged grains along the edges of the lids. They feel sticky or scratch when you wake in the morning. Such material must be removed very carefully. Rubbing the lids will spread bacteria and cause irritation. If you are troubled with sticky eyelids, ask your school nurse or doctor for advice.

A sty is an inflammation of a small gland along the edge of the lid. This gland secretes an oily substance that keeps the lid moist. If bacteria get into one of these glands, the result may be the swelling and redness that we call a sty. If the sty is rubbed, the bacteria are easily spread to other glands along the lid and more sties develop. In some cases the doctor cleans out the pus from a sty. Perhaps he will pull out an eyelash or two. Never attempt to do this yourself.

Use your own towels and washcloths. Serious diseases of the eye, such as trachoma, are sometimes spread from one person to another by using common towels. Bacteria are easily wiped from the eye to the towel and from the towel to the eyes of another person. Have you paper towels in your school? These are the safest and least expensive type of towel for public use. How do you arrange your towels at home so that each person knows which towel is his?

If a cinder or other small object gets into your eye, do not rub your eye. Often just leaving it alone and letting the eye water, as it does when it is irritated, will wash out the speck. Sometimes carefully lifting the upper lid over the lower lid brushes off the cinder. If it does not come out, see a nurse, a doctor, or someone else who knows exactly how to remove troublesome objects from the eyes. Rubbing the eye may cause the cinder to scratch the eyeball and make it easy for bacteria to do a great deal of harm.

These suggestions are all simple to follow, but they are of great importance. Your eyes are so precious that practicing these simple daily habits seems easy in comparison with the joy and success that healthy eyes can give.

THINGS TO DO

1. Have you felt any sign of possible eyestrain mentioned on page 129? If so, have your eyes examined.

2. Stop reading for a minute and sit in the position you are now in while reading. Are you holding your book up—not letting it lie flat on the desk? Are you holding your head up—not bending low over the book? Are you sitting with your hips back against the chair and bending forward from the waist? If you were not reading in good posture, read that way now. Then try to keep the good position you have taken.

3. What facts from this section can you apply in the following situations: reading in school; reading at home; sewing at home; reading on a train; arranging a place to study at home?

4. How can you make your mind save your eyes? Which of these ways can you practice?

When you study, don't read all the time. Before you begin to read think, "What do I already know about this subject? To what questions do I want to find the answers?" While reading, stop on important points, close your eyes, and see whether you really got the meaning. After reading, rest your eyes while you review and recite to yourself or with a friend.

When you look at TV select only the best programs and view them as suggested on page 133.

What other ways do you think of?

5. Make one "Do and Don't" cartoon about some important way of caring for the eyes.

6. Help a younger child to form good habits of using his eyes. Show him exactly what to do—the correct way to hold his book, for example. Then see that he holds his book that way every time he begins to read. Give him approval when he holds his book correctly.

7. Use a scientific way of telling how much light there is in a room. See if you can have your classroom lighting tested with a light meter. A light meter may sometimes be borrowed from the health department or the lighting company. Check on the following points at school and at home:

Are the windows clean?

Is the light kept out by thick curtains at the windows?

Are the shades pulled so that you get light from above and no glare?

Are the desks placed so that the light falls on the pupils' work?

Have pupils learned how to prop up their books instead of laying them flat on their desks?

8. Arrange a table or desk at home so that you will have good light for reading. The light should be good in the daytime and after dark. Is there anything you can do to have a better light at night without buying a new lamp? Talk this over with your mother or father.

9. Keep a record of the accidents to the eyes that occur in your school for one term. What caused them? How could they have been prevented?

DISCUSSION QUESTIONS

Be prepared to correct any false statements. Give reasons for the changes you think should be made.

1. When your eyes are being examined it is important to pay attention and answer questions carefully.

2. If light rays focus in front of the retina, a person is nearsighted.

3. Myopia is a condition in which a person sees distant objects more clearly than objects that are close to him.

4. Nearsighted people do not need glasses for reading.

5. Astigmatism is "cross-eye."

6. Children outgrow "cross-eye" without any special care or attention.

7. Washing the eyes with boric acid or other eyewashes strengthens them.

8. The eyes of all newborn babies should be treated to prevent blindness.

9. Some eye diseases are spread by using a common towel.

10. If your eyes do not hurt, they are in good condition.

11. Frames of glasses should be adjusted from time to time.

12. Holding your book or work too near your eyes or reading in bed may cause eyestrain.

13. Neither glaring light nor dim light is good for reading.

14. Good eyesight is an aid to safety.

15. Well-balanced meals are an aid to good eyesight.

INTERESTING BOOKS

FITZPATRICK and BAIN—*Living Things*, pp. 245-248

MCCOY—*Whom Shall I Consult—Optician, Optometrist, Oculist, Ophthalmologist or Ophthalmic Physician?*

NATIONAL SAFETY COUNCIL—*Goggles*

UNIT V

BONES AND MUSCLES

We should be proud that we can stand up strai Because we stand on our two feet and stand tall we do the things human beings can do. We can see far on all sides. We can run fast and easily, climb lad and trees, drive cars and airplanes. And the acrobat do still other things.

We could not do these things without well-built b and muscles. Let us learn more about how muscles bones are built, how they work together in many w and how to give them the best care.

BUILDING BETTER BONES

Bones grow. In infancy and early childhood they grow rapidly. They grow more slowly in the late teens. For good growth minerals and vitamins are necessary. Direct sunlight helps to build good bones. Using the bones correctly also helps to make them strong and useful.

Some boys and girls were curious enough about bones to ask the following questions:

How many bones are there in the human body?

Which bones in the body are used the most?

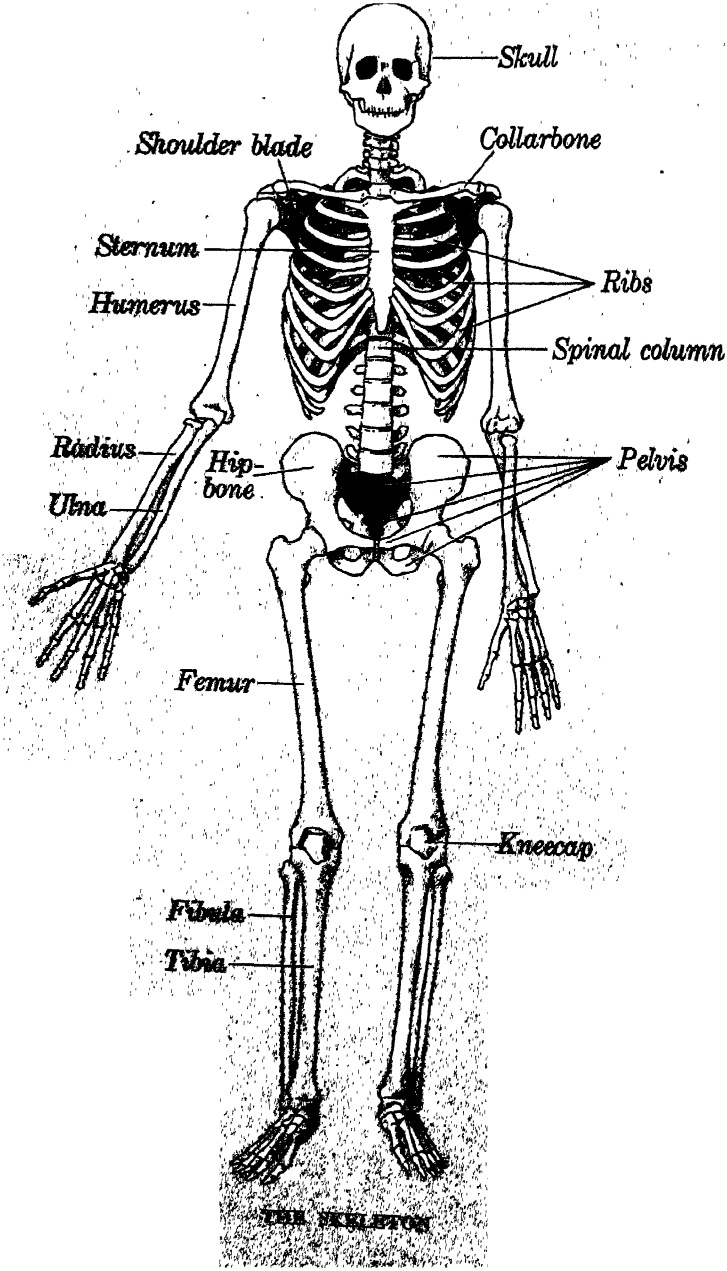
Why do bones break easily? Can a broken bone be mended so that it will be as strong as it was before it was broken?

What can one do to have strong, well-shaped bones?

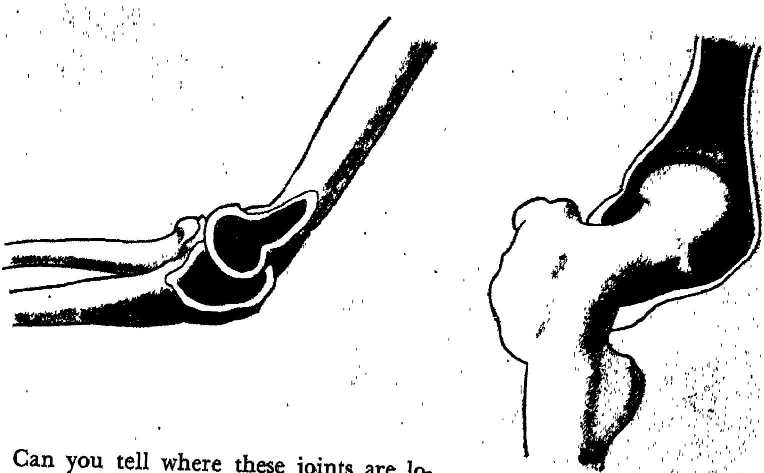
Suppose that you had to sit down and make 206 bones of many different shapes and sizes. That may seem to you difficult to do, but every person builds over 200 bones. There are 64 of these bones in the arms and hands alone. You can see a diagram of the principal bones of the body on page 144.

It is impossible to say which bones are used the most because all the bones are being used all the time. The bones of the skull are protecting the soft brain tissue underneath them every moment. All the bones together, which form the *skeleton,* are constantly being used as a framework of the body. They help to hold all the organs in their proper positions. Some bones, however, are moved more often than others. The ribs move up and down seventeen or eighteen times a minute on the average. Our legs and our arms are very active much of the time.

You can see in the skeleton on page 144 that the bones



THE SKELETON



Can you tell where these joints are located in the body? Study the picture on page 144 for your answers. Parts of the bones have been cut away to show the marrow (shaded areas).

are joined in many places. These joining places are called *joints*. If there were no joints in your hand or arm, you could not write a letter or throw a ball. Have you ever noticed how the bones in a chicken leg fit together at the joint? Have you noticed how smoothly the ends of the bones are covered with a slippery membrane? This membrane secretes a thick substance somewhat like white of egg. The membrane and the fluid it secretes help the bones to slide over one another smoothly and noiselessly. Your bones do not creak when you move, like the hinge of a door that needs oiling. Stiff and painful joints may result if this membrane and fluid are injured by accident or disease.

The bones are held together at the joints with strong bands called *ligaments*.* These help to prevent the bones from wobbling in all directions. For example, the ligaments at the elbow joint, together with the structure of the bones themselves, permit the forearm to bend forward but not backward or sideways. People who are "double-jointed" have bones that are fastened together more loosely than those of the average person. There is only one joint at a joining, not a double joint.

Sometimes bones slip out of position. The upper-arm bone may, in an accident, be pushed out of the socket—the round cup-shaped bowl into which it fits. In this case we say that the person has a *dislocation* * of the shoulder. Some people's jaws are easily dislocated. When a jaw has been dislocated, the person cannot talk or eat until the bone has been pushed back in place.

But the bones cannot move themselves. They are pulled into different positions by the muscles. Bend your forearm as you do when you want to show how big your muscle is. What happens? Do you notice that the muscle on the inside of the upper part of your arm has become thicker? That muscle is contracting. It is helping to pull your hand toward your head. At the same time muscles on the other side of the arm relax and lengthen.

The muscles and bones work hand in hand. They make it possible for you to walk, run, throw a ball, play the piano, or laugh out loud. The muscles move the bones. But what moves the muscles? Your arm does not bend of its own accord. You do not suddenly find yourself walking. All the movements you make because you want to make them (the *voluntary* * movements, as they are called) require messages back and forth between the brain or *spinal cord* * and the muscles. Nerves tell the muscles when to contract and when to relax. Thus movements are made by bones and muscles and nerves working together.

Bones are built of two kinds of subtances, an animal part and an earthy or mineral part. The animal part makes the bone flexible—that is, slightly yielding, not stiff or rigid. The mineral part consists chiefly of calcium and phosphorus in combination with other elements. These mineral substances make the bones hard. Perhaps you would like to know exactly the amount of the different mineral compounds in bones:

Tricalcium-phospho-carbonate	88 per cent
Magnesium phosphate	2 per cent
Calcium fluoride	0.3 per cent
Calcium chloride	0.4 per cent
Iron	0.1 per cent

What percentage of the bones is mineral? Look at the first compound. What elements do you discover in this compound? Do you find calcium, phosphorus, and *carbon* * ? How many times do you find calcium in the list of mineral compounds in bones? How many times do you find phosporus?

There is a larger proportion of animal substance in the bones of young children than in the bones of older people. There is a larger proportion of the mineral substance in the bones of older people than in the bones of children. Which bones can be bent more easily—the bones of children or the bones of older people? Which bones break more easily—the bones of children or the bones of older people?

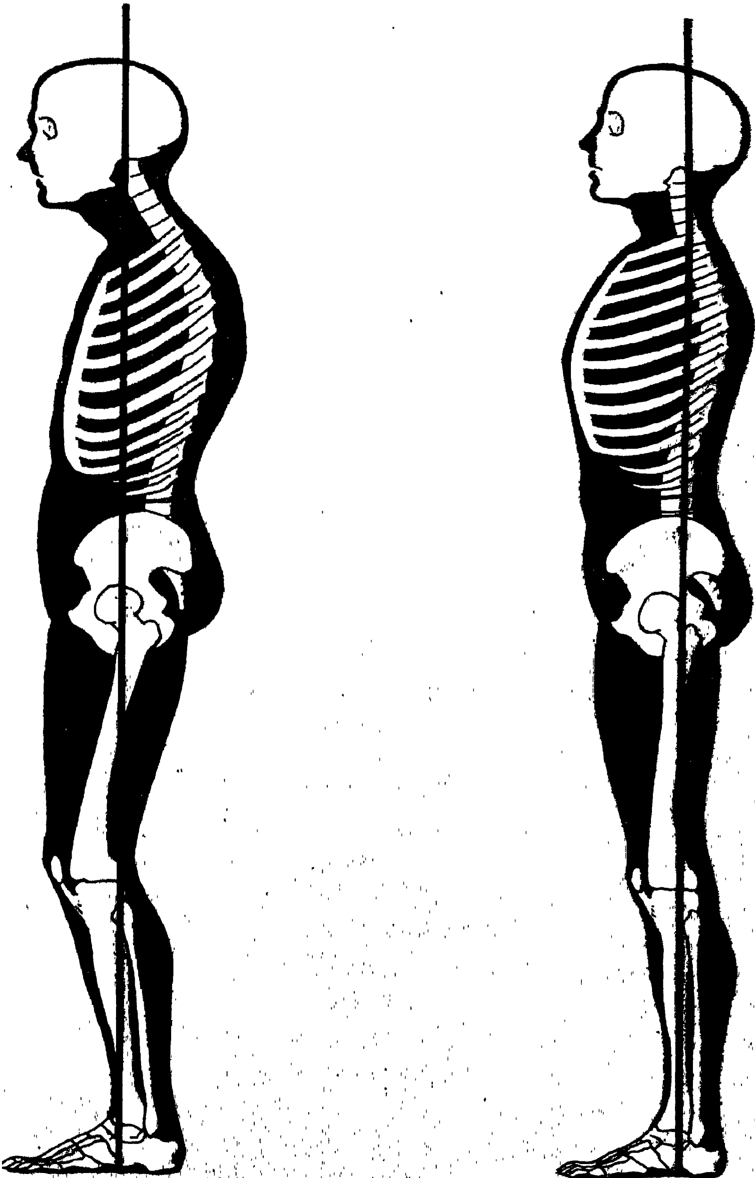
A few people seem to have fragile bones even when they are young. This may be because they do not have sufficient calcium and phosphorus in their food, or it may be because their bodies do not make good use of the minerals. The exact reason why some persons' bones break easily is not yet known.

The long bones of your arms and legs are not solid material all the way through. They are hollow in the center. The hollow tubes are filled with a soft substance called marrow. Have you ever bought a marrow bone for soup? The marrow is the birthplace of red blood corpuscles, you remember. New red blood corpuscles are formed in the marrow of certain bones.

YOUR RESPONSIBILITY FOR GOOD BONES

1. *See that broken bones have proper care.* Have you known someone who broke an arm or a leg? The breaking of a bone is called a *fracture.** If the skin is uninjured, the break is known as a *simple fracture.* If the bone of a young person is set properly—that is, if the two ends are placed together and held by splints in the correct position—by a doctor, the broken ends usually grow together in a short time and the bone is as strong as before. If the skin as well as the bone is broken, the fracture is *compound.* A compound fracture does not mean, as you might suppose, that the bone is broken in two or more places. It means that, in addition to the break in the bone, there is an open wound through which an end of the bone often pushes its way. Very great care must be taken to prevent infection in the case of a compound fracture. On pages 197-201 you will learn about first aid for fractures.

2. *Eat the food that builds bone.* The food needed to build and repair bone tissue is brought to the bone cells by the blood. Waste products are carried away by the blood just as it is from cells of other parts of the body. Bones are built in much the same way that teeth are built. What have you already learned about building



THE BODY FRAMEWORK IN POOR AND IN GOOD POSTURE teeth? The first important step in building bones is to supply the elements of which bones are made.

3. *Get some sunlight, too.* The second step is to provide sunlight and vitamin D, which enable the calcium and phosphorus to be used to advantage. *Rickets* * occurs chiefly in the winter and late spring, when there is a deficiency in ultraviolet light; it almost disappears in the summer, when the sun shines clear and bright. It is more common in cities where the sunlight is shut off by smoke than in the country where the air is clearer.

Natural sun baths, at no expense, should be used more wisely and widely. In temperate climates a half hour of sunlight daily is healthful for most people.

4. *Wear clothes that fit you.* Poorly fitting tight blouses and coats tend to pull the shoulders forward. They may cramp the rib bones, which help to form the chest cavity. Tight belts and garters interfere with the circulation. Heavy skirts fastened at the waist tend to pull the abdomen downward, when good posture demands that it be held inward and upward. Since the bones of children are somewhat flexible, they are more easily bent in wrong positions than the bones of older people. "Just as the twig is bent, the tree's inclined."

5. *Do suitable exercises to improve your posture.* You see in the illustration on page 149 that there is a slight inward curve of the lower part of the backbone. If this curve is exaggerated—that is, made greater than is natural—a poor posture results. It is sometimes called *swayback.* Here is an exercise to make this curve more nearly normal.

Stand about four inches from a wall with the feet about four inches apart. Bend the knees, thighs turned outward. Press the small of the back and shoulders flat to the wall, keeping the chin in and the head high as though you were being lifted from behind the ears. In this position slowly straighten the knees, counting eight. Hold the position with abdomen held in while you count eight, breathing naturally. Relax. Repeat eight times.

This exercise will help to flatten round shoulders:

Take the same position against the wall. Place the hands on the shoulders, elbows pressed down to the sides of the body. Keep the knees slightly bent. Slowly raise the arms above the head, keeping the elbows close to the wall. Return the hands to the shoulders. Repeat four to eight times. Then relax. Be careful not to let the head poke forward.

The arm swing is another good exercise:

Stand in good position with the arms relaxed at the sides. Swing both arms slightly forward above the head, keeping the elbows straight and the palms facing forward. Try to touch an imaginary wall with the backs of the hands. Stretch and reach back as far as you can. Do this with a little swinging movement three times; then relax and drop the arms to the sides. Repeat eight times.

If your head pokes forward, push it forward on purpose, keeping the shoulders back. Then, make believe someone is pushing your face back. At the same time lift the head up from behind the ears. This will put your head in a perfect position.

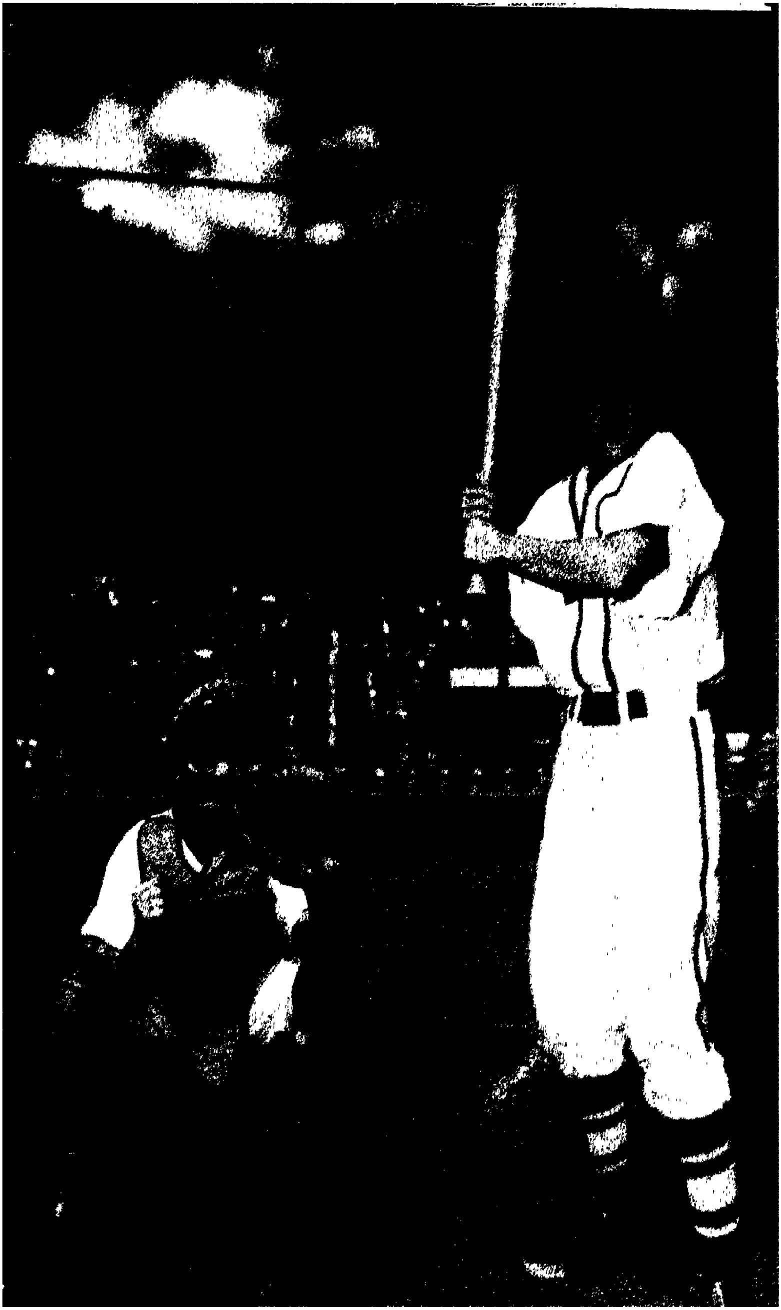
You can easily see in the pictures on page 149 how poor posture, like poorly fitting clothing and shoes, throws the bones into wrong positions. In addition to its value in training the bones in the way they should go, good posture adds greatly to personal appearance. It also makes possible greater ease and skill in movement and increases self-respect.

Poor posture almost always results in additional muscular effort and strain. That strain can cause such fatigue that the health of the person will be affected. The strain on the joints can injure tissues and even change the structure of the body in places.

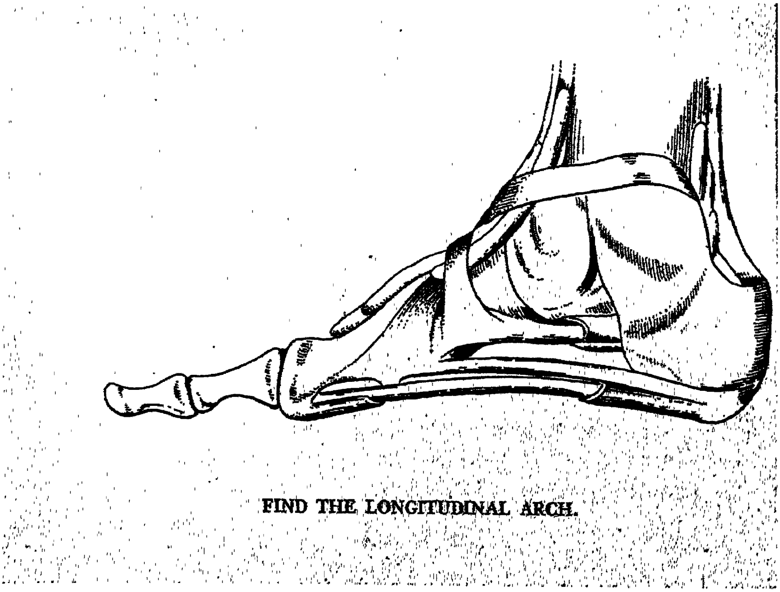
6. *Wear shoes and stockings that fit your feet.* Do not go to extremes. Shoes may be too tight or too loose. Heels may be too low or too high for a particular person. Some people are embarrassed whenever they have to take off their shoes and stockings because of the red and ugly corns and bunions on their feet. How different the feet of some grown people are from the beautiful feet of little children! The beauty of the feet is easily spoiled by shoes that are too short, too pointed, too tight, too large, or in general not the shape of the feet they are intended to fit. It is difficult to see how anyone, after studying the shape of normal feet, would attempt to wear shoes that are different in shape from the feet themselves.

"Flatfoot" is a common kind of foot trouble, due to failure of the foot to bear the body's weight. Flat feet are usually weak feet, that is, feet and legs having weak muscles and ligaments. The bones of the foot form a *longitudinal* * and a *transverse* * arch, which are normally held up by the muscles and ligaments of the foot. When you make a wet footprint, you see the gap left by a strong longitudinal arch. The transverse arch runs across the bottom of the foot a little over an inch from the base of the toes. When the muscles are weak, and the weight of the body is put on the longitudinal arches instead of on the outer borders of the feet, the arches are strained and may fall. Fallen arches often cause pain in the legs and back as well as in the feet. "Flatfoot" often causes so much pain that a person stops walking and playing games and so loses the benefits of exercise.

"Flatfoot" is not a good name for this trouble, first,



Musical activities provide wholesome recreation.

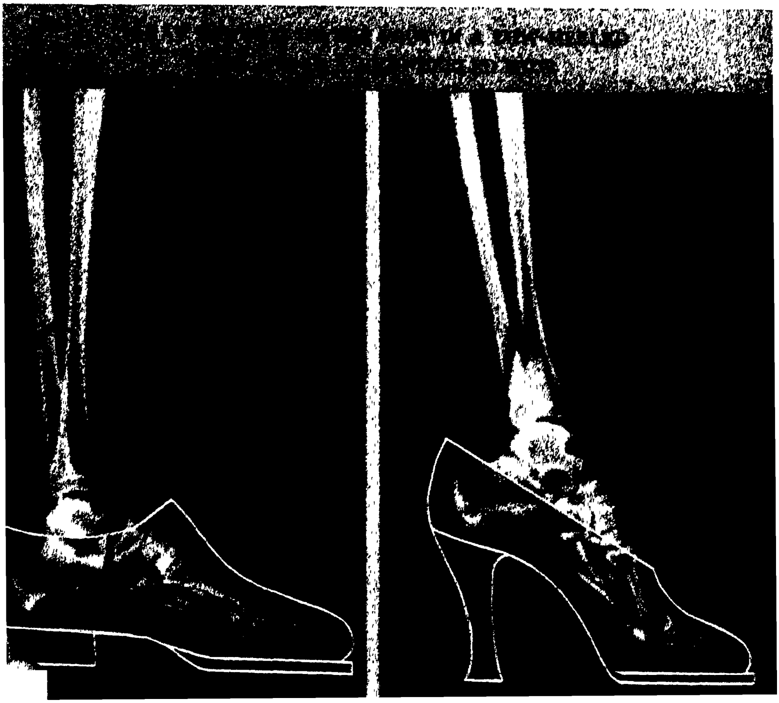


FIND THE LONGITUDINAL ARCH.

because feet may have quite high arches and still give pain; second, because some feet with quite low arches carry the body's weight easily and give little or no pain.

Sometimes the muscles of the foot are weak because the body as a whole is poorly nourished or has been poisoned by bacteria. Sometimes the muscles that support the arch are weak because they have not been exercised. Walking correctly, especially in bare feet, with the heel touching the ground first, with the weight then put along the outside of the foot, and with the toes gripping the ground at the end of the step and pointing straight ahead, is excellent exercise for strengthening the foot and leg muscles. In standing, the weight should be thrown to the outer borders of the feet, not over the arches. Special exercises (see pages 155-156) are also good for the muscles of your feet.

A high heel causes the foot to be used in an unnatural way. Human beings do not naturally walk on their toes, as high heels make them do. This unnatural use of the foot tends to throw too much weight on the front part of the foot and to strain the transverse arch. People wearing high heels are less steady on their feet and consequently are more likely to stumble and fall than people who wear low heels. They are more likely to turn their ankles and sprain them. People in high-heeled shoes very commonly walk awkwardly. Have you ever seen anyone whose entire body was thrown into a somewhat unnatural position because of the high heels she was wearing? Do you wear shoes having heels that are not more than one and one quarter inches high and that are almost as broad at the bottom as they are at the top? Shoes with open toes and open heels are a poor choice. They do not protect and give enough support to the feet. If your feet are "killing you," see whether you are killing your feet.



1. Someone in the class should ask the butcher for a long bone. It should be sawed across the middle and lengthwise. Make a diagram of this bone, showing the outer hard part, the knobby head of the bone, and the hollow part filled with marrow.

2. If there is a science *laboratory* * in your school, plan to do this experiment with the help of the science teacher. Weigh the cleaned leg bone of a chicken. Burn it on wire gauze. Let it cool and weigh it again. How has the bone changed? Why is it necessary to handle it very carefully? Which part of the bone burned away? Which part was left? Mix the burned bone with dilute *hydrochloric acid.** Dip a piece of clean platinum wire into the mixture of bone and hydrochloric acid. Then hold the wire in the flame. An orange-yellow color shows that calcium is present.

3. Put a chicken bone—such as the wing—into dilute hydrochloric acid for several days. Has it the same shape as before? Can it be bent easily? Can it be tied in a knot? Which part of the bone has been dissolved out by the acid?

4. Make a "Do and Don't" cartoon on care of the bones. Put it in a class exhibit with other cartoons.

5. Read about teeth again. Make a list of the things you can do to have good teeth. Put a star after the things that will also help to build good bones.

6. If the muscles of your feet are weak, practice the following exercises daily with bare feet: (1) Walk about on your heels with the rest of your feet off the floor, toes curling under, and the soles facing toward each other as far as possible. (2) Sit with your legs stretched out, the feet about a foot apart. Try to make the soles face each other, without bending the knees. (3) In the same position use your feet like paddles, moving them from the

ankles and curling the toes under. Then try moving them round and round, clutching the toes at the same time. (4) Try to pick up small objects with your toes. (5) Rise on your toes, putting your weight on the outside of your feet.

7. Use now the physiological facts that you have learned to solve the following situations: (1) You have difficulty in sitting and standing in good positions. (2) You have a baby brother or sister whom you wish to have strong, well-built bones. (3) You are going to buy a new pair of shoes. (4) You wish to get plenty of sunlight this winter.

Discussion Questions

1. Here is another chance to test your knowledge. You can do this by copying the sentences here and on page 157 and adding the word or words that have been left out of each sentence.

In my body there are about —— bones. These bones form the —— that supports and —— the organs underneath. The ends of the bones fit into one another at places called ——. Over the ends of the bones a thick —— secretes a fluid which ——. To keep the bones from slipping out of place, —— are fastened to them.

I eat foods containing —— and —— to build strong bones and keep them in good repair. Children's bones are —— brittle than older people's. When we talked about keeping our body framework in good repair in class, we all remembered what we had learned about choosing foods. We decided these foods are especially important for building bones: ——. We made some posters to show how sunlight makes us grow and helps to prevent ——.

We talked about ways tight clothes —— bones. One of the girls brought in some pictures of the kind of clothes people our age used to wear. I am glad we wear more comfortable clothes now. To have some fun, we tried walking on our tiptoes. Then we could feel the strain on the muscles of our ____. To walk correctly, touch the ground first with the ____, then put the weight along the ____ of the feet.

2. What changes have you noticed in your physical appearance? Have some parts of your body, such as your feet, arms, and legs, nose or ears, grown faster than other parts? If you feel you are too short or too tall, too fat or too thin, awkward or clumsy, what is the best attitude to take about these growth changes? Make a cartoon showing a good and a bad way to feel about these problems of growing up physically.

INTERESTING BOOKS

BRANDWEIN and others—*You and Your World*
FITZPATRICK and BAIN—*Living Things*, pp. 89-193
LANE—*Your Carriage, Madam!*
MORTON—*Oh, Doctor! My Feet!*

BUILDING AND TRAINING THE MUSCLES

Some people are proud of having big muscles. Football coaches used to choose the boys with the biggest muscles for the team. Now they usually choose boys who have the best control of their muscles. In these times it is more important for most people to have useful, obedient muscles than to have very large, strong muscles. Useful, obedient muscles will help you to walk, dance, play ball, and skate gracefully and easily. It is through games and sports and other exercises that strong, useful, obedient muscles are built.

Good control of your muscles makes you feel more alive and full of energy. Skill in the use of muscles enables you to play games better and to have more fun and more friends. It also helps you to feel at ease. Boys and girls who are growing rapidly sometimes feel awkward or self-conscious. As soon as they gain better control of their muscles, they no longer feel awkward. If you are skillful in the control of your muscles and learn not to feel self-conscious, you will always feel at ease.

Look at newspaper pictures of athletes playing team games. Notice that each player is in a position that helps him to move with the greatest ease. Games, sports, and dances help to develop grace and a sense of rhythm, lightness and quickness in motion, and friendliness and interest in people. In order to play volleyball, for example, you have to learn the weight of the ball and how hard a push is necessary to make it go where you want it to go. Think how many muscles are being used in following the ball with the eyes; running to meet it; jumping to reach it; bending backward, sideways, or forward; and tossing it over the net.

Not all boys and girls should take the same kind and amount of exercise. Games that use muscles in all parts of the body and are fun to play are in general the best games to develop the muscles. Boys and girls who have heart trouble or certain other physical defects may not be able to play the more vigorous games. When you have a health examination at the beginning of the year, ask the doctor which games and sports are best for you.

One of the pleasantest things the members of a family can do is to play out of doors together. Deck tennis can be played in a small back yard or on a flat roof. Throwing iron horseshoes, pitching quoits, and playing handball are other games that can be played in a small space. Many families swim and go camping and ride horseback. Some go fishing. What games and sports do you play with your family? What others might all the family learn?

How many of the following questions, which other school boys and girls have asked, have already been answered?

Why do high school students take physical education?

What is the best exercise to build muscles? Do games make your arms stronger?

Does athletics make you stronger? Does athletics ever do harm?

What are some family games?

Does farm work train the muscles?

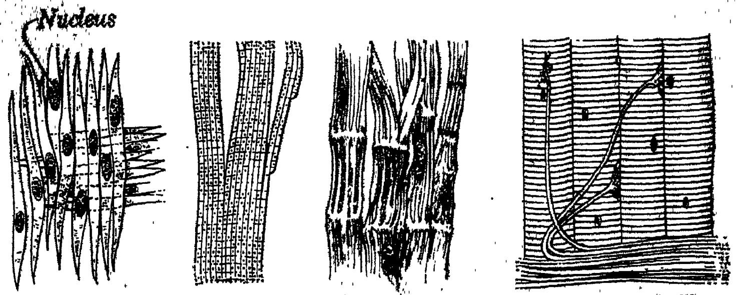
Should all boys and girls play the same games?

How many muscles are there? What are muscles made of? How do they move the bones? Why do they become thicker and harder when they are used?

There are 792 muscles in the body. When you are standing still, about three hundred muscles are being used to keep you in that position. When you are playing any of the active outdoor games, you are using many of the muscles in the body; they are all working together for the common good. A skillful person has good muscular control. All his muscles work together smoothly. An awkward, clumsy person has poor muscular control. His muscles do not work well together.

Each muscle is made up of a group of fibers. Pictures of some kinds of muscle fibers are shown on page 161. Hundreds of thousands of muscle fibers are used when you stand or sit, throw a ball, or walk upstairs. If a baseball pitcher wants to throw a faster ball, he calls on a few hundred thousand more muscle fibers.

The large muscle that hardens and thickens when you bend your arm—the *biceps* * muscle—has a large, red central part that contains about 260,000 fibers. It narrows at the ends into small, white *tendons.** The tendons are somewhat like hands for the muscle. By



Plain cells from intestine *Long striped fibers* *Plain fibers from intestine* *Four long striped fibers with their nerves*

1. INVOLUNTARY* 2. VOLUNTARY 3. INVOLUNTARY 4. VOLUNTARY

A FEW OF THE MANY KINDS OF MUSCLE FIBERS

means of the tendons the muscle holds on to the bone and makes it move. When the biceps muscle contracts—grows shorter and thicker—it helps to pull the bone of the forearm toward your head.

The muscles that move the bones are called *voluntary* muscles. When you throw a ball, you use voluntary muscles. These are controlled by the brain and spinal cord. You can make these muscles act when you want to. The muscles that cause movements in the internal organs are called *involuntary* muscles. The movements of the stomach, for example, are involuntary. You cannot make the stomach muscles contract whenever you want them to. In the picture on this page you will see both kinds of muscle fibers. The involuntary muscles are controlled chiefly by another part of the nervous system, called the sympathetic nervous system. (See page 287.)

When the muscles are used a great deal, the fibers become larger. They crowd out some of the fat. Fat feels flabby. Muscle feels firm. That is one reason why trained muscles are harder than little-used muscles.

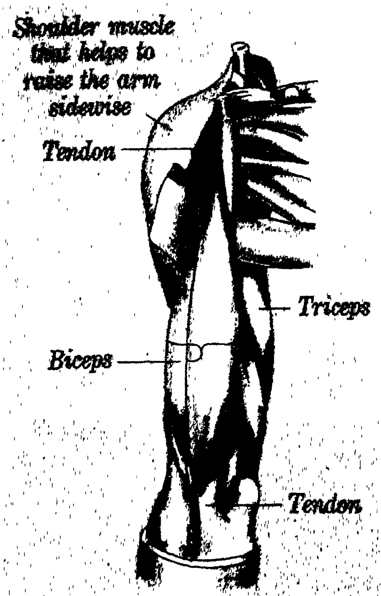
Outdoor play trains the muscles to do good work. It aids growth and increases your happiness. It keeps you out in the fresh air and sunlight. Games help you learn how to be a good sport and help you to form habits of getting along well with other people. Play is not useless or a waste of time.

YOUR RESPONSIBILITY FOR YOUR GOOD MUSCLES

1. *Supply your muscles with enough food of the right kind.* You can help to build your muscles by eating the right kind and amount of food. Since muscles are built chiefly of proteins, sufficient proteins should be included in the diet. A quart of milk, two to four ounces of meat, and an egg, together with the bread, vegetables, and fruit you usually eat, will furnish sufficient protein.

Minerals and vitamins are also necessary. Without calcium the muscles cannot contract normally. A lack of vitamin B_1 may cause a certain kind of paralysis of the muscles. Milk, whole-wheat bread, eggs, and green vegetables are rich in both vitamin B_1 and calcium.

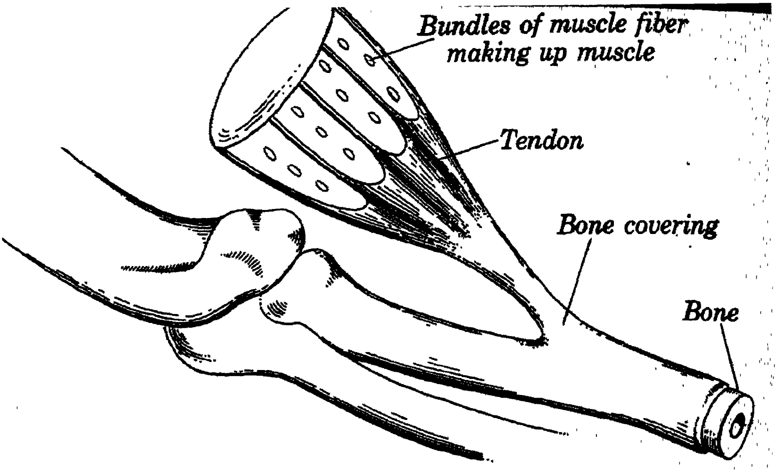
The energy for muscular work is obtained from food. When muscular work is done, about one fifth of the energy obtained from the food is used in making certain muscles contract. The remaining four fifths are changed into heat. That is why exercising makes you warm even on cold winter days. The food to be used by the muscles to furnish energy is stored in small quantities in the muscles and in larger quantities in the liver. When the



MUSCLES OF THE ARM A
SHOULDER AS VIEWED FRO
THE FRONT

supply in the muscles is used up, more must be brought into the blood stream to replace that which was used up in exercise.

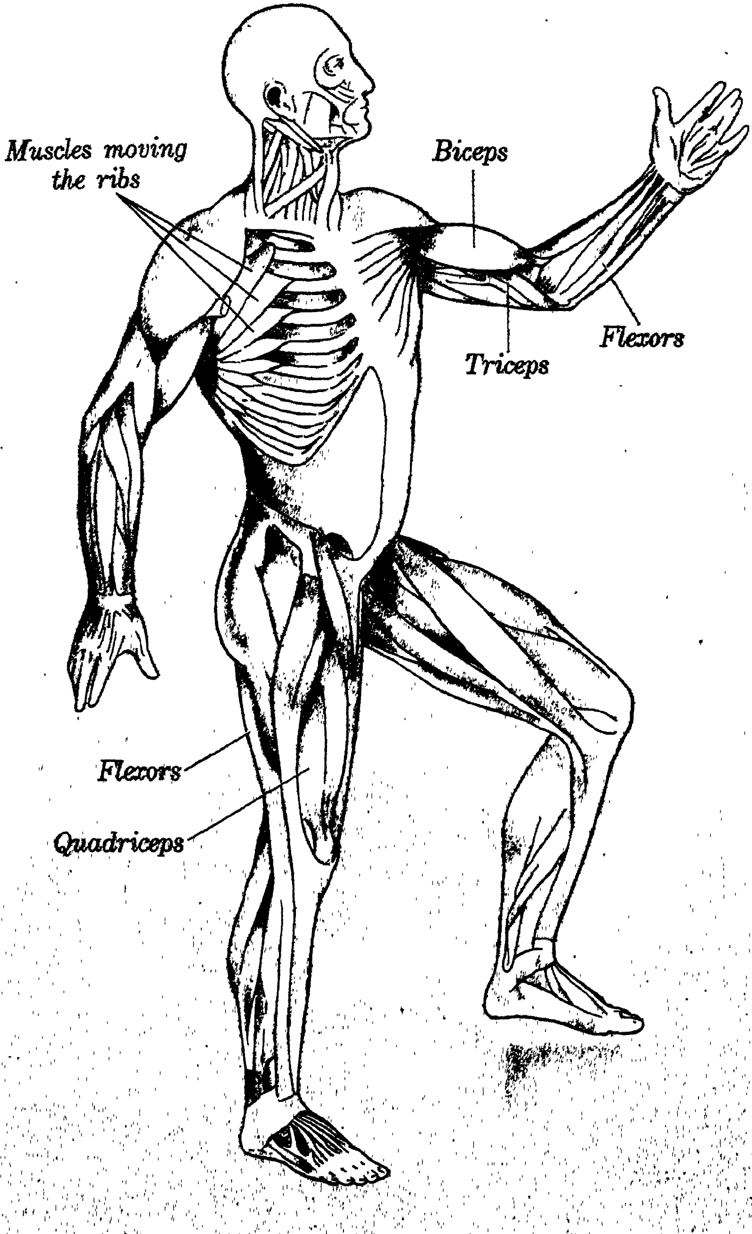
2. *Train your muscles for the kind of life you want to live.* There are several ways in which you can train your muscles. You can learn to play good games in the best places. Every neighborhood should have some places in which to play. If it does not, someone should see that playgrounds are built. Many cities and states have provided excellent parks and beaches where people have the opportunity to walk, play tennis and golf, go swimming and boating, skate, and ride horseback. You should find a place in your neighborhood where you can enjoy outdoor exercise. It may be only a blank brick wall on a



A CLOSE-UP OF THE WAY TENDONS ARE FASTENED TO MUSCLES AND BONES

side street, but you can have exciting games of handball there. It may be only two barrel hoops fastened to trees or posts in a vacant lot, but you can organize a basketball team and have good fun. It may be a vacant lot on which rubbish of all kinds has collected, but you can clean it up and make a football field or a baseball diamond.

Boys and girls—especially girls—in the upper grades of the elementary school often give up their outdoor games and put no other kind of outdoor exercise in their places. How do you spend the two hours after school in the afternoon? Country boys have useful outdoor work to do. Sports and farm work, if not too heavy, train both muscles and minds. If you gain skill in the popular outdoor sports while you are young, you will often be able to make friends more easily in new neighborhoods. The longer you wait to learn to swim, skate, or play tennis or golf, the more embarrassing it is to be a beginner.



THE MUSCULAR SYSTEM

The muscles that you use in sports are connected with the brain or spinal cord by nerves that carry messages from the muscles to the brain and from the brain to the muscles. When you have learned to skate or play tennis, the messages that the nerves carry are those that make the muscles move skillfully in skating or hitting a tennis ball. The more often the right movements are repeated, the surer you are to make the right movements the next time.

The muscles are trained if you exercise regularly every day. Daily exercise of a kind suited to the individual is beneficial in many ways. Here is a summary of some of the effects that suitable exercise is said to have:

(1) Exercise helps to keep the muscles well nourished. The appetite is better; more food is eaten; more food is used by the muscles.

(2) Exercise develops skill in the use of the muscles, so that a person can walk, dance, and play more gracefully than he could without practice. It gives self-command and poise.

(3) Exercise improves the circulation by making the blood flow faster to all parts of the body.

(4) Exercise strengthens the muscles in general. The heart muscles are also strengthened because the heart is given sufficient work to do to keep it in good condition. If the muscles of the body as a whole are flabby, the heart is likely to be flabby also.

(5) Exercise of certain kinds increases the size of the chest and the lung capacity.

(6) It increases greatly the amount of oxygen used and the amount of carbon dioxide given off by the body.

(7) It aids greatly in the removal of waste products from the cells, because the waste products are carried away quickly by the rapidly flowing blood and lymph.

(8) Exercise (but not right after eating) may improve digestion by strengthening muscles and by increasing the flow of lymph and blood through the abdominal organs and thus removing waste more rapidly.

(9) Outdoor exercise may improve the complexion by increasing the supply of blood to the skin and by the stimulating effect of outdoor air and sunlight.

(10) Exercise may increase weight by improving nutrition, or it may reduce weight by using up excess fat.

(11) It leads to sound sleep.

(12) It often relieves mental strain and conflict.

(13) It gives a sense of adventure.

(14) Exercise increases the joy in life. Is there anything pleasanter than skillful skating on a clear, winter day; or swimming in cool, soft, sunny water; or striding along a woodland path with a feeling of freedom in all the parts of the body?

(15) Playing on a team or in any other group gives a feeling of success and a sense of "belonging."

Suitable exercise is beneficial; unsuitable exercise is harmful. It is fine to camp and to climb a mountain if you are in training to do so. It is not good to climb a mountain, take an all-day hike, play football, run races, or engage in other strenuous exercise without having gradually prepared for vigorous activities. It is not a good plan to try to take all your exercise over the week end and neglect it during the rest of the week. Daily exercise is best. "Nothing in excess" is the best rule to follow in exercising.

3. *Do not decrease the efficiency of your muscles by drinking alcoholic beverages.* Experiments carried on in mountain climbing, in the marching of soldiers, and in typesetting all tend to show that under the influence of even moderate doses of alcohol the individual being stud-

ied, though he thinks he is doing his work more easily and better, is actually using more energy but accomplishing less work and making more mistakes than when not under the influence of alcohol. The old saying, "Wine does not help us to do a thing well, but makes us less ashamed of doing it badly," now has science to back it.

4. *Balance rest and exercise.* It is natural to feel tired after exercise. There is a comfortable kind of tired feeling that comes after exercise. You feel hungry, sleepy, and contented, like a drowsy dog beside the fire. After resting or sleeping, you feel more energetic than ever.

But there is sometimes an uncomfortable, tired feeling in which you are stiff and sore and perhaps "too tired to sleep." Feeling this way is a sign of overfatigue and should be avoided.

Real campers know how to rest. After they have walked some distance, they stretch out in a warm, dry place and relax. After a short period of rest, they are ready to go on again.

When the muscles are working, they use up their supply of energy and give off waste products, among them carbon dioxide and certain acids. The lack of substances to supply energy and especially the unremoved waste products cause fatigue. During rest the poisons of fatigue are being removed from the muscles. A warm bath or a warm shower followed by a cool shower helps to stimulate the circulation of the blood. The stimulation removes the waste products of fatigue more rapidly and brings oxygen and food substances to aid in overcoming fatigue. Such a bath or shower may do much to make you feel more rested and to prevent soreness the next day. After a game athletes take showers for these reasons as well as to wash away dirt and perspiration.

There is another important physiological reason for resting after working and playing hard. During severe exercise "we run up an oxygen debt." This debt must be paid during rest. After you have run a race, you keep on breathing deeply for some time in order to pay back the extra oxygen you have used up.

Instead of trying to continue working when you are really tired—not just tired of working—it is better to rest for ten or fifteen minutes and then return to work. Factory workers have found that they actually do more work if they rest for ten minutes several times a day than if they work continuously without resting.

In fatigue, not only must the poisons be removed by circulation, but the body cells must be built up again also. Even the cells of the brain must be built up. In sleep poisons are removed and body cells are built up. That is why we need plenty of sleep every night. At least ten hours of sleep are needed by boys and girls of thirteen and fourteen.

If a person is tired from doing one thing, it is restful to do a different kind of thing. Eyes tired from study are rested when a person goes for a walk. Of course the person who is tired all over should go to bed for a nap or a night's sleep. A person who works at a desk all day will be much more tired at the end of a day than one who works at a desk half of the day and does housework or outdoor work the other half. A person who can switch several times a day from eye-brain work to large-muscle work and back again is very lucky. He will feel little fatigue at the end of a day.

Problems to Solve

1. Jane was often late for gym classes. Sometimes she did not come at all. Her counselor had a handful of slips, all showing she had not been in gym class.

"I know," Jane said to the counselor, "it's true. And there are more times when I didn't get caught. I'm a Houdini for my own way of life!"

"Your own way of life?" the counselor said, wanting to know more.

"Look, Miss Smith, I get enough exercise. I walk four miles a day, just getting to school and home again. I don't need physical education. What I want is time — time to read and read and read. Because I'm going to be an actress — some day." Jane stopped short.

"I'm glad you came in to talk with me," said the counselor. "Now, with your gym teacher's help, we can plan together a better kind of program for you."

Why should Jane have gone to the counselor sooner?

2. How do you look when you hurry? Is this a problem for you? Look at some other people as they walk in a hurry. Some of them look grim, as though they were going to have a fight. They push their heads forward. They pound their heels into the ground. They often bump into things and people.

How do you want to look? You can walk fast and look smart, too. Don't hurry with your face. Relax the muscles you are not going to use in walking. Then lift yourself up by imaginary strings fastened to your ears. Look ahead. Keep your head, shoulders, and arms relaxed. Easy does it. At each stop give a good push with the toe of your back foot. Then swing that leg forward quickly. If you walk this way, you'll gain speed and look streamlined.

3. It was after school one Wednesday afternoon. In the gymnasium boys were playing volley ball on one court; girls were playing on another court. At the end of the gymnasium other boys and girls were playing badminton. In the smaller playroom, others were having fun playing table tennis and shuffleboard. In the lunchroom they had pushed back the chairs and tables to make room for square dancing.

Everyone was having a good time. At first it looked as if there were no teachers around. But three were there, and they were having as much fun as the boys and girls.

The seventh and eighth grades had planned this program themselves. First they had asked the principal's permission. Then they chose a planning committee that got ideas from the whole class. They divided into groups of ten. Each group played a different game for six weeks. Almost everyone came to this after-school recreation hour.

How could you help get a recreation hour like this in your school? Discuss the question in class. A committee might be appointed to draw up plans.

DISCUSSION QUESTIONS

Tell which of these statements are true. Correct those that need to be changed. Be ready to discuss them in class.

1. The more exercise you take, the better your health will be.
2. A person with weak muscles can never be popular.
3. The size of muscles is less important than how useful and obedient they are.
4. The only reason for playing games is to develop one's muscles.
5. You use some of your muscles all the time, even when you sit quietly.
6. Voluntary movements are controlled by the sympathetic nervous system.
7. Fats and carbohydrates build muscles.
8. Most of the energy obtained from food is used in making muscles contract.
9. Proper kinds of exercise will help a thin person gain weight and will help a heavy person lose weight.
10. Do not exercise if exercise makes you tired.
11. A short rest is not a waste of time.
12. Outdoor exercise is a good way of waking yourself up when you feel dull or irritable.

INTERESTING BOOKS

BRANDWEIN and others—*You and Your World,* pp. 79-84

FITZPATRICK and BAIN—*Living Things,* pp. 194-199

FOWLER, COLLISTER, THURSTON—*Science and You,* pp. 273-290

NEUGARTEN—*How You Grow*

NORDLY—*Want to Be a Champion in Home and Neighborhood Games*

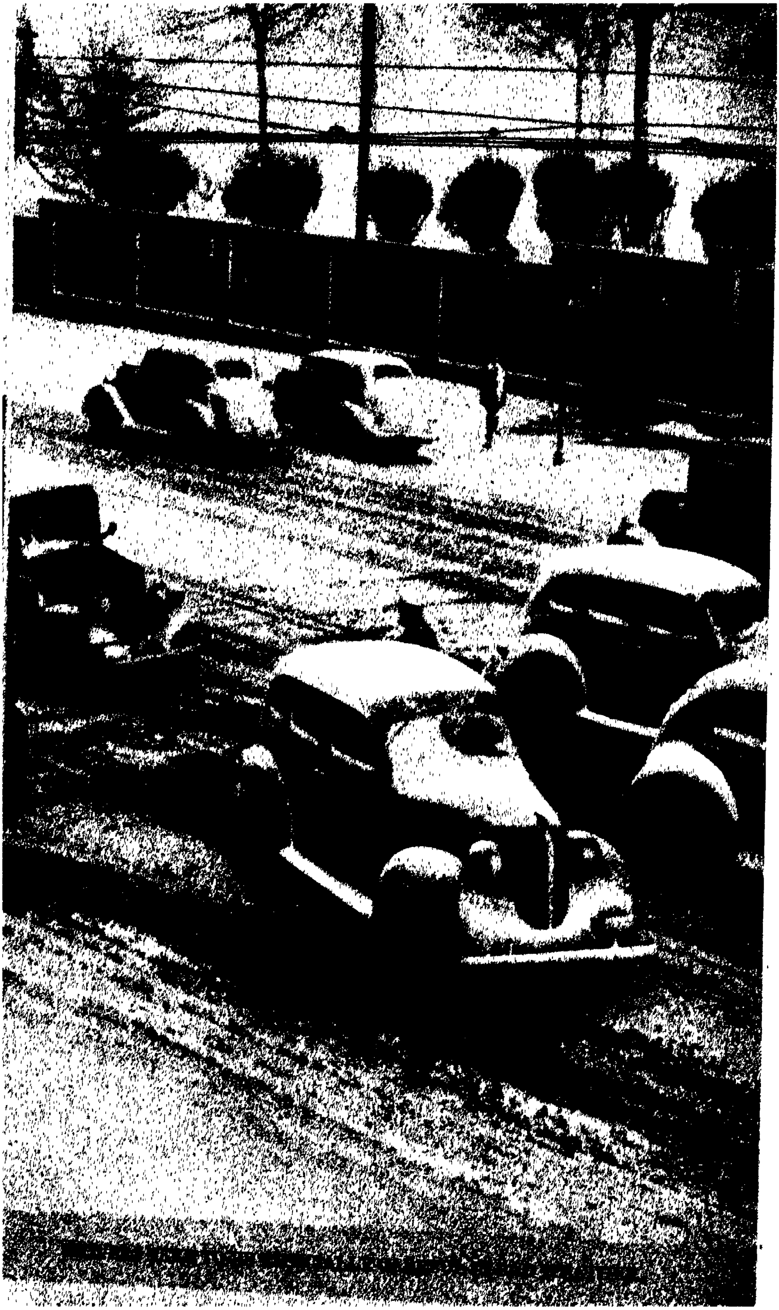
SHACTER—*Getting Along with Others*

WATKINS and PERRY—*Understanding Science,* pp. 398-401

SAFETY

Truck drivers drive more than most other people a
have fewer accidents. This is because they take pride
being careful. Many boys and girls are afraid to be ca
ful because they think other teen-agers will call th
"sissies" for being careful or for being unwilling to t
chances. Smart people are careful. Careful people
smart.

But, if someone near you is unfortunate enough
have an accident, do you know what to do to help hi



SAFE AND SANE

The accident rates for teen-agers are higher than the accident rates for children. Here are some reasons some teen-agers have given:

Al said, "People think they're here just once and might as well do as they please; they let themselves go."

Bill said, "Some people don't seem to care what happens to them. But when it does happen, they say, 'Oh, why wasn't I more careful!' "

According to Helen, "Ignorance and stupidity are the main reasons; people either don't know better or they just don't care."

"It's a mystery to me why people do things they know they shouldn't," said Joan. "For instance, staying on the beach in the sun although they know they've had enough and will suffer from sunburn for a week."

Al and Bill have a somewhat new idea of what causes accidents. Sometimes people do not think very highly of themselves; they have a poor idea of their own worth. They do not think of their good points and how important they are to their family, friends, and country.

Helen had the more common idea of why accidents happen. You will find facts about different kinds of accidents in the next pages.

But facts are not enough. Two other things are needed: (1) wanting to be the best kind of person you can become, and (2) the influence of someone whom you like.

WHEN YOU ARE ON THE STREET

Have these habits become a part of you?

1. Don't be a Jay; cross only at the street crossings.
2. Obey the traffic signal or the policeman.
3. Try to cross where there is a traffic signal.
4. Walk straight across the street, looking first to the

left and then to the right to make sure that the way is clear.

5. Walk; do not run. Do not zigzag from one clear spot to another.

6. Keep to the right on crosswalks.

7. Never step into the street from behind or in front of parked cars.

8. Look out for cars that are backing.

9. Get out of a parked car on the side toward the curb, away from traffic.

10. Do not stand in the street, except in a well-protected safety zone. Be careful going to and from these zones and while you wait in them.

11. Do not play in or near the street. Do not chase balls into the street and do not skate or coast there.

12. Be especially careful when you are in a hurry, when you are carrying packages or an open umbrella, and when there are crowds.

13. Walk on the left side of country roads, facing traffic.

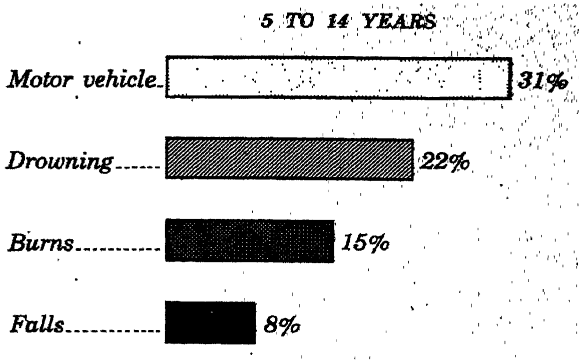
14. Wear something white or carry a light on roads at night.

15. If you do not see or hear well, be especially careful in dangerous places.

SAFE BICYCLE RIDING

By now you know a great deal about ways to ride a bicycle safely. What is good form in riding a bicycle? What about following traffic signals? Is it dangerous to hitch rides or to carry passengers on the handle bars? How do good riders prevent accidents?

*Intersections** are places where bicycle riders, as well as *pedestrians* * or drivers of automobiles, need to be very careful. About half the *collisions* * between bicycles



PRINCIPAL TYPES OF FATAL ACCIDENTS

and motor vehicles occur at intersections. Turning into the path of traffic, disobeying or failing to give signals, and getting caught between cars cause serious accidents. About three times out of four the collisions are the fault of the bicycle rider. The fourth time the automobile driver is to blame.

SAFETY IN AUTOMOBILES

When you are riding in an automobile, your safety depends upon the driver of your car, the condition of the car and road, and other drivers and cars. You can usually avoid riding, at least more than once, with anyone who is careless or who has not learned how to drive well.

Your driver needs to know how to control his car. He must follow the rules for starting, stopping, turning, and passing other cars. On curves, hills, or slippery pavements he should drive more cautiously than ever. He needs to be able to see ahead and to the sides, to stay on his own part of the road, and to stop or turn to keep from running into cars, people, or objects in his path.

His car should be in good condition. You know what happens if you try to stop your bicycle when the brakes do not work. An automobile is going faster and is harder to stop. Drivers who go so fast that they cannot control their cars are dangerous drivers. A driver who cannot see or hear well needs to be more careful than other drivers. A driver who is tired, excited, or thinking about something else or who talks with his passengers so much that he forgets to watch the road and other cars is a dangerous person to ride with. You know of course better than to ride with any stranger or with anyone who has been drinking even a small amount of alcoholic beverages.

As a passenger you can help the driver by sitting in one place and not crowding him. When he is in heavy traffic or if talking disturbs him, let him give all his attention to his driving. Should you see something coming that you think he does not notice, be sure not to scream or jump or do anything else to upset him.

Some states have very wisely set the legal driving age at 16 years. This means that no boy or girl under 16 can have a driver's license. No boy or girl under 16 is allowed to drive even around the neighborhood. This is a wise rule because young people may not have the control over their muscles that safe driving demands. Their eyes, nervous systems, and muscles may not work together quite so quickly and smoothly as is necessary to avoid accidents. Young drivers may be careless and take risks. Whatever the reasons may be, they have more accidents, on the average, than do older drivers.

You should never drive without a license or a learner's permit. If you do, you are, in the first place, breaking the law. You might have an accident. You might be injured, or you might cause someone else to be hurt. If you damage the car or run into some other car, who will have to pay for the repairs? It is not fair to cause your family such unnecessary expense. Anyone who breaks traffic rules or who drives without a permit or a license is likely to have to pay a fine. If you are under driving age, this may be a larger fine. In case of accident the judge is likely to say that a driver under the legal age knows he is breaking the law when he drives. The result for the young driver and his parents may be serious trouble and expense.

When you are permitted to drive the family car, remember that it is the family car. Be fair. Take your turn cheerfully. Your father and mother may need the car. Your brother or sister may want it. Perhaps you can plan so that one driver may take another member of the family where he wants to go.

When boys and girls first begin to drive, they sometimes wonder why their parents object to their taking crowds of young people with them. There are several good reasons for the objection. In the first place, as you have seen, the young driver seldom has enough experience to be as good a driver as he will be after more practice. He may not know what to do in an emergency.

Young drivers, like some older drivers, may not realize what close attention they need to pay to their driving. Some young drivers think that they are grownup as soon as they get behind the wheel. They try to show what good drivers they are and how clever they are. They are like children who ride with their hands off the handle bars of a bicycle to show how brave and smart they are.

A crowd of boys and girls may forget to help the driver by allowing him to attend to his driving. Sometimes they are excited. Talking and shouting may bother the driver, but he usually does not want to say anything to stop them. He may not know that he is bothered. Or the crowd may overload the car. Three in the front seat give the driver less room. Radio programs may take his mind off his driving. Passengers who lean over to tune in another station should be careful not to bump the driver's arm or to get in the way so that he cannot see the road.

Some boys get old cars and fix them up at home. The condition of the car is an important part of safety. Old cars in poor repair are harder to control. Often they cannot be relied upon when sudden action is needed to prevent a collision.

When you are permitted to drive, know your car and how to control it, know and obey traffic rules, keep yourself and your car in good condition, and pay close attention at all times to what you are doing.

Remember that a good driver is always learning more. Because he knows simple driving, he does not think he knows it all, any more than a good ball player thinks knowing how to catch, pitch, and say rules is all there is to baseball. If you play ball, you know you must keep in good condition, practice until you have skill and control, and always be on the alert to help your team play a good game. In driving also you have to consider the other fellow. He may not always do what you expect him to do, or he may fail to follow safety rules. Then you have to know what is best to do without having to stop to think. There is little time to think in sudden traffic danger. Losing your head may cause an accident.

STORES AND OTHER PUBLIC BUILDINGS

It is not enough to know how to prevent accidents when you are walking, riding your bicycle, or riding in an automobile. You have already learned ways of preventing accidents at home or at school. Make a list of ways to prevent burns, fires, cuts, falls, and other home or school injuries.

These safety suggestions apply to many times and places, just as skill in catching or throwing a ball helps you to play different kinds of ball games. But each of these games has special rules and requires special skills. There are special safety rules for special places. Schools and streets might be called public places, but there are a few other public places that we have not yet talked about.

Most of you run errands to the store. When you go to the neighborhood stores, follow the general safety rules for pedestrians or for bicycle riders.

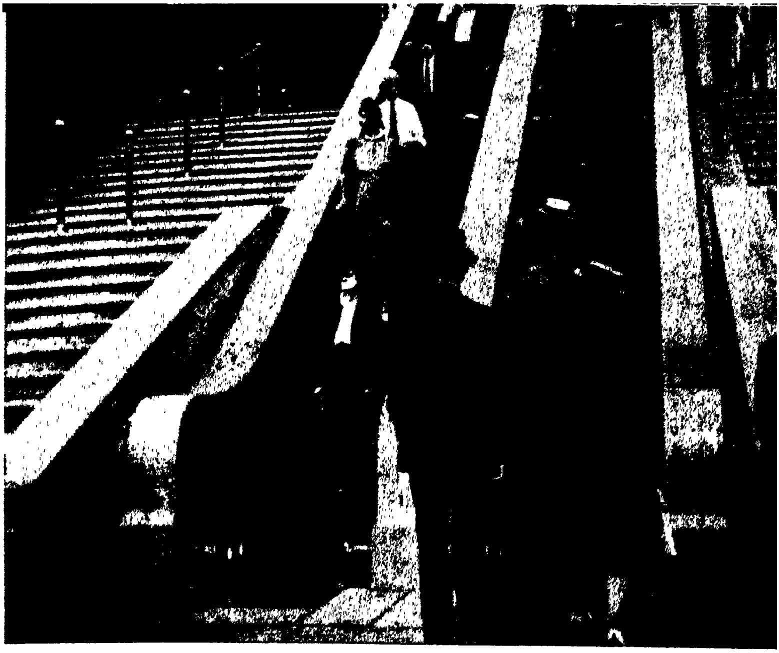
To go to the store, you may take a bus or streetcar. Remember to stand on the curb while you are waiting and to make sure that the way is clear between the curb and the car stop. Get on and off the bus or streetcar carefully. Look where you are going when you leave it.

If you shop in large stores or go into an office building to meet your father, you may use revolving doors. Each section is made for one person at a time. Two people do not have room and may stumble. To get in, you push against the frame of the section. Pushing so hard that you cause the door to whirl makes it hard for other people to stay on their feet, and you may lose your balance. As soon as your section opens into the building or street, step out. Then you will not be caught in the door.

In crowded stores and large buildings follow the same safety rules you use in the halls of your school: Walk alone. Do not block traffic. Keep to the right. Avoid pushing or bumping into other people. Allow yourself room to go around corners or around showcases. On stairways your general stairway rules will help you.

Buildings several stories high have elevators. There may be someone to point out which elevator is coming to your floor and to act as a sort of traffic policeman to prevent crowding. There may be a light or signal to show which elevator is coming. Keep to the right to get on an elevator; do not shove. Wait until the passengers who are getting off are out; then step as near the back of the car as you can. Look to make sure that you do not catch your toe in case the car is not even with the floor. Only a certain number of people may ride in an elevator at one time. Elevators must be kept in good repair. To make sure that they are safe, the government has men look them over every so often. You may see a sign telling when the elevator was last examined.

The operator has been trained to run the elevator safely and to watch that no one does anything dangerous. The warning, "Watch your step," is given when people



are getting on and off. "Stand back, please, and face the doors," is something you often hear in department stores. More people can ride comfortably at one time if everyone faces front. It is easier to get out at your floor then. When the operator closes the sliding gate or door inside the elevator, he looks to be sure that no one is near enough to be caught by it.

It is easier to carry packages close to your body and high in your arms. When someone behind you wants to get out, try to move to one side. If you are in the front of a crowded elevator when it stops, step off; then step back when you have let the passengers for that floor get off. Keep to the right when you get off at your floor. Have you ever seen a woman stand in everybody's way while she made up her mind whether she wanted to go to the front of the store or to the back?

Some railroad stations, stores, and other public buildings have *escalators,** or moving stairways. The steps flatten out at the bottom and top of each flight. Place your feet well on the step of the escalator, away from the crack, so that you will have a firm place to stand when the step rises. The side of the escalator, except the belt along the top, does not move. If you held to the stationary side, you would be pulled backward. When you reach the top, be ready to step on the floor and out of the path of people behind you. Going down, be careful not to slide into those ahead of you.

Watch your step. Do not crowd. These are two good rules to follow when you are at the movies, other theaters, and public auditoriums.

Public buildings should be made of fireproof material and kept in such good condition that they are not likely to burn. Not many fires start in public buildings. Yet, if a fire should begin, there must be ways for people to get out of the building quickly and safely. By law a certain number of exits must be provided and marked. The number varies with the kind of building and its size. Usually the word "Exit" in red letters is placed over exit doors and entrances to stairways. Even in daylight the exit sign may be lighted.

Should you ever smell smoke or see flames when you are in a public building, look for the nearest exit and walk to it. Do not run. Panic breaks out when people become excited and try to run. Keep your head and get out as soon as you can without running.

NEW BUILDINGS AND VACANT HOUSES

Most boys like to watch the men who are working on new buildings. If you are watching, keep out of the way and stand where nothing will fall on you. Look out for trucks and moving machinery. There may be a fence or railing around a large new building or the lot where it is to be. This is to keep lookers-on out of danger and out of the way. If a workman asks you to step back, do so at once.

Playing around a half-finished house is dangerous because the floors and stairways are not yet safe. You might fall or stumble over loose boards and nails. Exploring vacant houses is a poor kind of adventure. In the first place, you are not supposed to go into other people's houses, whether or not they are vacant. Then the windows may be boarded up and the rooms dark, so that you cannot see dangerous spots, and floors and stairways are often broken or weakened.

PARKS, PUBLIC PLAYGROUNDS, AND CARNIVALS

In parks and playgrounds follow the same safety rules as for traffic and for games anywhere else. Look out for balls or players when the grounds are crowded. Do not dart out in the path of cars. Around the swings and slides keep out of the way of players. Look where you are walking. Braces for playground equipment sometimes run out along the ground and may cause falls.

In amusement parks you will find roller coasters, merry-go-rounds, and many other kinds of "rides." At the "ride" there may be someone to see that you take no extra risks, or there may be signs warning against dangers. Wait until the apparatus has come to a full stop before you get on or off. Do not crowd and shove. If there are straps or bars, fasten them in place before the machinery starts. Keep your arms out of danger. Most important, do not try to stand up while the roller coaster or other machine is moving and do not lean too far out the side. You might be thrown, or you might fall. A few

people become sick on coasters, particularly when they sit in the front seat, where they can see how far the track dips. If you are in charge of small children, hold on to them. They may become frightened and try to jump.

Most of the equipment in a well-run park is fairly safe; but if it looks rickety, you had better stay off. This is especially true when tracks go high off the ground. Sometimes small traveling carnivals have old equipment in poor repair, or which will not stand much strain.

An out-of-door picnic is often more fun than a crowded amusement park.

ZOOS AND CIRCUSES

At the zoos or at animal tents of circuses there are usually signs, "Please do not feed or tease the animals." Animals are like people in some ways. When animals eat too much or eat what is not good for them, they may get sick. They cannot always decide what is good for them, as you can.

Have you noticed how often we have mentioned signs in public places? That is the only way people may be warned of dangers in public places. Be sure to read what signs tell you. The signs about feeding animals are for your own safety as well as the animals' safety. It would be easy to get too close to an animal or to try to have an animal eat out of your hand. You might be hurt. Poking sticks at animals is cruel and may bring a person close to claws or teeth. Can you blame an animal for trying to stop people from teasing it?

At circuses the stands sometimes fall down when they are not put up solidly or when too many people crowd into them. Such accidents, however, are rare. There is more danger from tripping over ropes or tent pegs when you go to the circus.

SAFETY ON THE WATER

When you think of boats, you probably think first of small boats—canoes or rowboats. Since for small boats the chief danger is falling overboard or upsetting, safety suggestions for small boats are discussed with swimming (pages 205-206).

But have you ever taken a trip on a large boat? The gangplank has strips of wood nailed across it or a mat to keep you from slipping. There may be a rope or rail at the side. There are railings to prevent you from falling over the edges of the open decks. The ship is made to carry you safely and comfortably on your way. Lifeboats and life belts are provided in case they should be needed.

On a large boat you must watch the doorsills. They are high. You might trip until you get used to them.

A CABIN ON A LARGE SHIP. NOTICE THE RAILING ON THE UPPER BUNK.

When the water is rough, you need to walk carefully. Some of the little outside stairways from deck to deck are almost like ladders. They are steep and narrow. It is interesting to watch the machinery that drives the ship through the water; but passengers are not permitted to go where they might be in danger or where they would be in the way of the men who run the ship. In your cabin you may have a bed or you may have a bunk. There is an edge to keep you from rolling out of your bunk. You climb up and down from the upper bunk. The person in the lower bunk must remember not to jump up far enough to bump his head. Some of the large ships have swimming pools as well as places to play games on deck. In both these places there will be safety rules to remember. What safety rules?

Modern inventions have made travel on trains safe and comfortable. The cars are made of metal, which does not burn and protects the passengers in case of a wreck. The engineers are skillful, and the tracks are smooth and well laid. A complicated system of signals and constant care of the tracks and trains make accidents rare. The death rate from railroad accidents has been decreasing since 1905. Many devices which add to the comfort and safety of passengers have been invented and installed.

Windows on trains may be closed or screened, so that a person cannot put his head or arm out. The platform between cars is closed in, but you are not allowed to ride there. Where there is air-conditioning, you are not likely to get cinders in your eyes. A trainman or a porter sets a box-step down, if it is needed, when you get

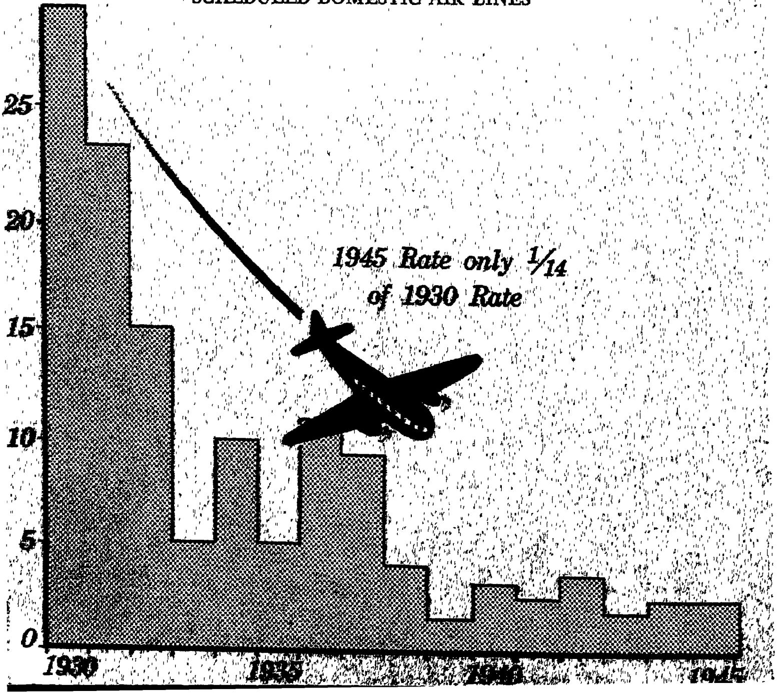
TRAINS NOWADAYS ARE SAFE AND COMFORTABLE on or off the car. Sometimes you may sleep in a berth on a train. You ring for a porter to bring a little ladder and help you in and out of an upper berth.

Buses have been made safer, too, as well as more comfortable. If luggage is carried on racks over your head, there are guards to keep it from falling down. Be careful not to stumble on steps up from the aisle. While the bus is moving, do not try to walk around. On some of the large buses you may have a berth at night, much as you do on a train.

Airplanes are being made bigger, safer, and more comfortable. The graph below shows that the passenger death rate on scheduled airlines in the United States in 1945 was only one fourteenth of the 1930 rate.[1] In 1952 there

[1] *Accident Facts,* p. 43; National Safety Council, Chicago, 1945.

PASSENGER DEATHS PER 100,000,000 PASSENGER-MILES ON SCHEDULED DOMESTIC AIR LINES



1945 Rate only 1/14 of 1930 Rate

were 72 deaths and 60 serious injuries on the scheduled airplanes in the United States. In the same year the death rate of passengers on scheduled airplanes was only 0.35 (less than one person) for every 100,000,000 miles traveled.

More than a dozen airlines carried their passengers without a fatal accident. In private flying, the number of accidents was very much larger.

The accidents that occurred were caused much oftener by errors made by pilots than by the weather. Almost one half of the accidents happened when the planes were landing, almost one fourth when the planes took off. That is why passengers should obey the sign, "Fasten your seat belts," which flashes on when the plane is about to take off or land. Passengers must also obey the sign that says, "No smoking." They must keep off the airfield except when word is given over the loudspeaker for them to get on their plane.

HOTELS AND OVERNIGHT STOPPING PLACES

When you are on a trip or spending your vacation away from home, you have to find a place to stay. The safety and healthfulness of camps are points you can inquire about before you decide where to go. When you are on a trip, you may know of places where you would like to stay; but often you have to choose after you have arrived in a city or have driven as far as you want to go that day. There are three kinds of stopping places—hotels, tourist homes, or cabins. Wherever you stay, you want a place that is clean, has comfortable beds and enough bedding to keep you warm, and is quiet enough for you to be able to sleep.

You may eat at the same place where you stay overnight, or you may look around for a restaurant. There again you try to find a place that looks clean, although cleanliness is not a sure sign the food will be safe. People who have done a good deal of traveling know it is wiser to eat foods that are easy to digest, such as hot soups, toast, soft-boiled or poached eggs, baked potato, vegetables and fruits, and milk if it is pasteurized. They avoid food that might have germs in it, such as custard pie or puffs, chopped meat, carelessly made salads, and other foods that are not thoroughly heated before serving and may not have been kept cold and covered. Out in the country you should find out whether the water supply is safe.

So far as safety is concerned, your general rules about stairways, elevators, and behavior in public buildings apply to hotels and tourist places. Most hotels are made of materials that do not burn easily, and they are kept free of many fire dangers. People from health and fire departments make sure from time to time that hotels are in good condition. In some states tourist homes and cabins are also inspected. Tourist homes and cabins are likely to be made of wood. In any case see where the nearest exit or stairway is located so that you would not have to hunt for a way out if a fire should start. Cabins may be warmed by small stoves or gas heaters. Leaving these burning overnight is dangerous unless you have good ventilation.

The hot water in hotels is often very hot. Test it before you take a bath or shower. The radiators may be quite hot. At home you may not have radiators, or you may be so used to knowing where they are that you do not have to think about them. In a strange room be more careful. As always, avoid touching a light switch or an electric fixture with wet hands or when you are standing in water. Wear slippers or your shoes in any public bathroom or bedroom. The person who had the room before you may have had *athlete's foot.**

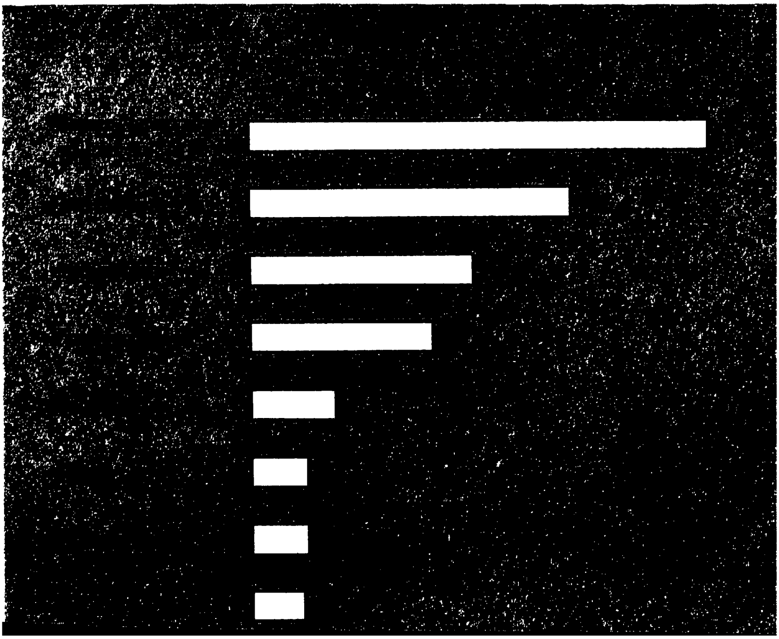
SAFETY AT WORK

In a recent year accidents killed 15,000 persons while they were at work. A far larger number—34,500—were killed away from work.

In addition to those killed at work there were about 2,000,000 persons injured at work. But this number does not include the millions whose injuries did not keep them from work for at least a day.

What are the most dangerous kinds of work? The graph on this page shows the number of deaths per 100,000 workers in eight main fields of work.[1] In which kind of work was the death rate—that is, the number of deaths out of every 100,000 workers—highest? Can all kinds of work be made safer? How?

[1] *Accident Facts, op. cit.,* p. 21.



Most of the deaths in industry are caused by trucks, railroad cars, and other vehicles; falling objects; falls; and electricity, poisons, and heat. Most of the injuries are caused by handling objects carelessly, by machinery, falling objects, and falls. These sources of accidents suggest ways to prevent accidents.

1. Keep tools in good condition; handle them correctly, put them away in their proper places.
2. Use safeguards on moving parts of machinery.
3. Wear proper clothing for the work, such as caps to keep hair from catching in machinery, rubber boots when handling live wires.
4. Wear goggles and other protection against flying particles, heat, and glare.
5. Know whether there is danger of lead or any other kind of poisoning and follow directions for protecting yourself against it.
6. Have a regular medical examination to discover any physical weakness or disease in its early stages.

WORKING TOGETHER FOR SAFETY

You alone cannot do everything necessary for safety. Safety means teamwork. You act in such a way as to prevent accidents to yourself and to other people. But there are many safety workers who help protect you. The members of a school patrol are safety workers. The policemen, the firemen, and the men who plan the roads and study ways of making traffic safer do their parts. Your town and state pass safety laws or regulations and see that they are obeyed. The national government has safety workers who plan and enforce other safety regulations. Look back over this unit to see what some safety workers do. Can you think of anything more they do?

Businessmen have found that it pays to make their factories and workmen safer. The government has certain regulations for places where people work at different kinds of jobs. Most of these are state regulations. There are also groups of people organized to study accidents and plan methods of preventing them. They make motion pictures and posters and print statistics and stories about safety. There are city and state safety organizations. The schools have safety lessons and safety councils. The National Safety Council is one of the organizations that work for safety all over the country. You would like to read the magazines the Council publishes.

PROBLEMS TO SOLVE

1. There is a danger zone in front of every moving automobile. This is the distance a car travels between the time the driver spots danger and the moment the car actually stops.

It takes time for a driver to make connections between what he sees and what he does. It usually takes three fourths of a second after he has seen a car about to cross his path or a child dart out into the street before he steps on the brakes. That is why his car moves ahead, after he has spotted danger,

50 feet if he is going 20 miles an hour
165 feet if he is going 40 miles an hour.

Drinking any alcoholic beverage before starting out will make him even slower to act.

What is the best thing for drivers to do to make the danger zone as small as possible?

What is the best thing for you to do when a car is coming fast?

2. What checks should you make on your bike to see whether it is in good running order?

a. Can your headlight be seen 500 feet away?
b. Can your horn be heard 100 feet away?

c. Can the tail signal be seen 300 feet away?
d. Are the pedals, handle bars, and seat tight?
e. Do the brakes take hold quickly?
f. Is just the right amount of air in the tires?
g. Do the chain and sprocket wheel have a guard to keep clothing from catching in them?

3. How can one common cause of accidents among teen-agers be prevented? Draw a cartoon showing what to do and what not to do.

4. Write and give a short safety play.

DISCUSSION QUESTIONS

Make two columns on a sheet of paper. Write the number of each correct statement in a column headed *Correct.* Write the number of each incorrect statement in a column headed *Incorrect.* Talk over all these sentences in class.

1. In recent years accidents have caused more deaths among boys and girls 10 to 14 years of age than any one disease.
2. Falls are responsible for more fatal injuries to school children than motor vehicles.
3. If pedestrians would follow safety rules, there would be few traffic accidents.
4. If automobile drivers would follow safety rules, there would be few traffic accidents.
5. Travel by airplane is now as safe as railroad travel.
6. Travel by scheduled airplane is not as safe as is travel by passenger automobiles.
7. Young drivers have few accidents.
8. Anyone who can drive around his own neighborhood can drive in city traffic.
9. It is safe for older children to play around old empty houses or houses that are being built.
10. Good manners in entering or leaving an elevator help prevent accidents.

11. Amusement park equipment is always safe to use.
12. More accidents occur when drivers are tired than when they are rested.
13. Travel on ships and railroads is safer now than riding in your family automobile.
14. Safety is a matter for teamwork.

INTERESTING BOOKS

NATIONAL SAFETY COUNCIL—*Accident Facts*

U. S. DEPARTMENT OF AGRICULTURE—*Farm Work and Safety for Young People*

WILLIAMS and OBERTEUFFER—*Health in the World of Work*

Pamphlets and other safety material may be obtained from the National Safety Council, the American Red Cross, insurance companies, and organizations in your community or state that include accident prevention in their programs. There is safety material also in the Boy and Girl Scout manuals.

FIRST AID FOR ACCIDENTS

We have been discussing ways of preventing accidents whatever you are doing and wherever you are. Now we shall talk about different kinds of injuries and what to do for them.

FRACTURES

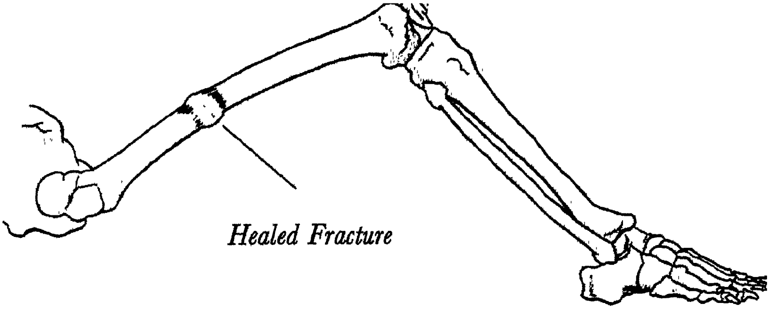
Let us see first what to do about injuries to bones and muscles. One of the more serious of these injuries is a fracture. A fracture, as you know, is the breaking of a bone. The doctor is the person to set a broken bone. Other people do not know how to set a bone correctly. They might not only cause a great deal of unnecessary

X-RAY PICTURES OF FRACTURED BONES

pain but might also make the break worse. If the ends of the broken bone have slipped out of place and are not put back just right, the arm or leg may be crooked or less useful after it heals. The doctor may use X-ray pictures to see what has happened and whether or not a bone has been properly set. In a compound fracture the ends of the bone have pushed through the skin. They must be treated so as to keep bacteria from getting in through the broken skin.

Most of the fractures boys and girls of your age have occur during play or as a result of falls while they are climbing. Good form, carefulness, and control of muscles help prevent such accidents. For people of all ages taken together, falls and motor-vehicle accidents are the chief causes of fractured bones.

Inside the house falls and fractures may be caused by



THIS BONE WAS PROPERLY SET AND HAS HEALED WELL.

toys or other loose objects on floors and stairways; dark stairs; loose rugs, especially near the top or bottom of the stairs; broken ladders or chairs that are used as ladders; and slippery floors, wet floors, and bathtubs. How can you reduce the danger from each of these causes?

When a bone breaks, the person usually feels or hears a snap. There is pain, followed by swelling and a bruised appearance of the skin. The part may look out of shape. Have you ever heard anyone say that his leg is not broken because he can still wiggle his toes? This remark is not necessarily true.

Call a doctor if there seems to be a fracture. Then keep your head and do what you can to make the patient comfortable. Have him lie down. Keep him warm and keep other people from crowding around him. Treat shock. (See pages 213-215 for first aid for shock.) Do all that you can to keep bacteria and dirt out of any cuts or wounds.

If the person injured is lying on the ground, put blankets or coats over him. Slip blankets or layers of newspaper under him if you can do so without moving the injured part. Ripping or cutting along the seams of any clothing that must be removed is better than trying to take off a coat or other clothing in the ordinary way. Shoes and stockings should be cut away. Be sure not to cut the skin.

Think twice before you decide that it is necessary to move the injured part of the body. Both sides of the break must be supported firmly with the hands. Otherwise the bone might bend and twist farther out of place. *Doctors warn against picking up people who have been injured* and hurrying them into automobiles. Many injuries are made more serious by rough handling. Moving a person who has a broken neck or a broken back may cause his death. A doctor should be brought to him at once. If the person must be moved, a splint should first be applied to protect the fracture. In the meantime pillows and blanket rolls are sometimes used for support.

An emergency splint is some rigid material used to keep the broken part from bending, although pillows, layers of newspapers, and other materials are sometimes used until a doctor can come to take care of the patient. First aiders use splints only when a patient must be moved or when it will be some time before a doctor can arrive. Splints should be long and wide enough to extend beyond the place of injury. Soft, very clean padding on the inside and out over the edges should be used. Splints should be held in place by bandages wide enough not to cut into the flesh. Tie the bandages snugly, but not so tightly as to cut off the circulation. Every twenty or thirty minutes loosen the ties and then replace them. If the part swells rapidly, allow for the extra size. Body cells die if circulation is cut off for long.

Before a splint is put on a limb that has had a simple fracture, the limb should be put in as natural a position as possible by pulling gently and steadily on the lower part. Do not try to set the bone. Do not even move the victim unless he must be taken out of danger.

For a compound fracture the first aid is more difficult. Bleeding may be controlled by pressing sterile gauze directly into the wound. Never try to push the bone back into the flesh. Do not pull on the injured limb to straighten it. Be very careful to keep your fingers and anything else that has not been sterilized out of the wound. Sterile dressings are used to prevent infection. The padding of the splint is arranged to leave an arch over the wound.

DISLOCATIONS

A dislocation occurs when a bone gets out of place at a joint. The ligaments and membranes may be torn. Tissues around the joint may be torn or bruised. Falls, blows, using the muscles violently or unskillfully are common causes. Dislocations of the joints of the arms and legs are more frequent among young people and children than among older people. A dislocation of the hip is serious, especially for older people.

There is a great deal of pain where there is a dislocation. The part swells quickly and cannot be moved. Cold *compresses* * relieve the pain and keep down swelling. If there is serious shock, use hot compresses. Slings or bandages to support a dislocated shoulder or elbow should not be pulled too tightly.

Most dislocations require a doctor's care, particularly if the skin is broken. A dislocated finger, as ball players know, can sometimes be put back into place by holding it firmly on both sides of the joint and pulling steadily in a straight line out from the hand. Should trying this twice not work, see a doctor.

SPRAINS

A sprain is a temporary dislocation. The bone is thrown out of place but springs back. Wrists and ankles are the joints most frequently sprained. Falls and playing cause many sprains. Lifting heavy loads may also stretch and twist joints out of place. Pain and swelling begin quickly when there is a sprain. Moving the joint makes it hurt more. Later the skin looks bruised. Some sprains are not very serious and are soon forgotten. In others the ligaments are torn.

A sprained wrist should be held up by a sling. For a sprained ankle, have the person lie down with his leg held up by pillows or rolled blankets or coats. Compresses wrung out of cold water, ice bags, or cold running water keep down some of the swelling and reduce the pain. A joint that has been seriously sprained should not be used until the doctor has examined it.

STRAINS

Strains are injuries to the muscles and tendons, varying from a severe stretching to a tearing of the fibers. People who lift heavy loads should be careful not to strain muscles. Stumbling, falling, playing, or heavy work on a farm may cause young people's muscles and tendons to be strained. Good form and carefulness are ways to prevent strain. In physical education class you can learn to lift and carry with the least strain.

Strains may feel like sprains. There are pain and stiffness, with increased pain whenever the person tries to move. The injured muscles must be given a chance to rest. Heat and gentle rubbing toward the heart stimulate circulation and reduce the pain. Rubbing helps more than liniment to overcome stiffness.

CHOKING

There are a number of injuries that may happen to the respiratory and nervous systems. A simple accident to breathing occurs when you choke while you are eating or drinking. Children sometimes say, "Something went down the wrong throat" or "down my throat the wrong way." Gulping down food or water may cause choking. If you turn back to the drawing on page 99, you will see how the passages for air and for food and water are separated from each other. Ordinarily when you swallow, a small lidlike structure closes the passage into the windpipe. Sometimes food or a little liquid gets into the trachea (windpipe) and you begin to cough and choke. A sharp slap between the shoulder blades may help remove the material.

Fishbones and other small objects swallowed accidentally may catch in the throat. Even when air can flow past them, you may choke. A small child may be lifted by his heels and slapped between the shoulders. To run your finger down his throat might push the object farther down and cut off breathing or scratch the mucous membrane. If choking continues, call a doctor.

Coins, pins, nails, and small toys are dangerous playthings for babies and small children. Usually when such things are swallowed, they go to the stomach. Giving a cathartic might cause the sharp object to be forced through the intestines. Ask your doctor what to do. Sometimes such objects get into the trachea and block breathing or injure the tissues of the lungs. To locate them, doctors now use the X ray. Then special instruments must be very skillfully handled to reach down the throat and take out the object. Have you ever read of some child being rushed by airplane to the hospital to have a safety pin removed from his lung? Although older people are less likely to swallow foreign bodies, as the doctor calls them, some strange things have been taken from the stomachs and lungs of grownups.

A baby's breathing is hardly ever cut off by a pillow or blanket that has fallen over his face. Most cases of *suffocation** of infants reported are really due to acute respiratory infection.

DROWNING

When breathing is stopped for more than a short time, suffocation is likely to occur. The length of time varies for different people. Unless normal breathing is restored or *artificial respiration* * started promptly, probably within fifteen minutes, the person will die. Drowning, *gas poisoning,** and *electric shock* * are the most common causes of the stopping of respiration.

When a person's nose and mouth are under water, his supply of oxygen is cut off. There is some oxygen in the air sacs in his lungs, but this is not enough to last very long. Many people have been drowned in shallow water or near safety because they lost their heads and became frightened. A drowning person does not always come to the surface three times, as many rescuers believe. Instead of struggling, a person who is in danger of drowning should try to float or tread water or "dog paddle," with his nose and mouth out of water. Rescuers can often find a rope, pole, board, or life buoy to which the drowning person may cling. If a boat is near enough, that is a good way to reach him and bring him to shore. Only strong swimmers who know how to handle a badly frightened person should attempt a swimming rescue. They know how to approach him from the rear. They know how to keep him from clutching them and dragging them under water. Boys and girls who take a course in lifesaving, such as the American Red Cross course, are better prepared to act wisely in rescue work.

Swimming and boating are fun and good exercise. Swimming helps you to build well-rounded muscles and gain muscular control. You will of course be careful to swim in places where the water looks clean. That may not always mean that the water is free from bacteria, but you *can* judge for yourself whether or not the water is clean. Look around for any sewer outlets or floating garbage. At a strange place ask about currents, the condition of the bottom, and the purity of the water. Then see for yourself before you do much swimming if the place seems safe. Pools should have pure water and be kept clean inside and around the edges.

These twelve rules will help you have a good time without accidents when you swim or use small boats.

1. Keep out of water that is over your head until you can swim well.

2. Rest two hours after eating before you go into the water.

3. Do not swim until you get tired or chilled.

4. Do not swim in water that is too cold and do not go into the water if you are chilled.

5. Do not swim alone and do not swim far out unless there is a boat with you. Use the "buddy system."

6. If possible, swim where there is a lifeguard on duty; but remember that he has a great many people to watch.

7. Follow a code of safe conduct in and out of the water. This means no practical jokes on other people or calling for help when you do not need it.

8. Be careful in diving. Know how deep the water is and the condition of the bottom before you dive. Walk carefully on slippery rocks or boards near the water.

9. Use a boat, pole, rope, or life buoy to rescue a drowning person. Try a swimming rescue only if there is no other means at hand and if you are sure you can make such a rescue.

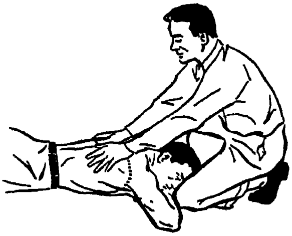
10. Do not take out a small boat or canoe, or ride in one, until you are a good swimmer. Go out only when the weather is good.

11. Do not rock or overload a small boat. Change places at the shore, not out on the water. Remember that canoes tip over very easily.

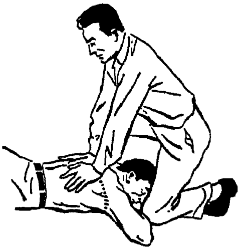
12. Pull a person into a boat over the end. Entering on the side may tip the boat over.

A person who has been under water is cold and often looks blue. If he is not breathing normally, artificial respiration should be started at once. This will force any water out of his lungs and will restore natural breathing if it is still possible to do so. Do not try to carry the person any farther than necessary to lay him down. Save every second; a few seconds lost may mean death. If the ground slopes, have his head downhill. Artificial respiration is given in the following way:

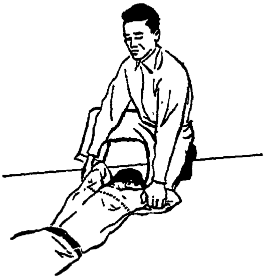
1. Place the person face down, with elbows bent and one hand upon the other. His cheek is placed on the hand with the face turned slightly to one side. The first-aider kneels at the person's head. He places his hands, thumbs touching, as shown in the drawing.



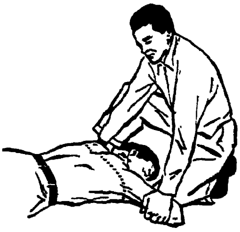
2. The first-aider then rocks forward slowly, keeping the elbows straight, until the arms are about vertical, putting steady pressure upon the chest to force air out of lungs.



3. The first-aider then rocks backward, slowly sliding his hands to the person's arms just above the elbow. This is to pull air into the lungs.



4. The first-aider continues to rock backward and raises the person's arms until there is resistance and tension at the person's shoulders. Then he drops the arms. That is the end of the complete process or full cycle. The cycles are repeated twelve times per minute. The pressure forcing air out and the expansion of the lungs pulling air in should be of equal length. The release should be done quickly.



If you learn to swim well, you will not be one of the 7,000 persons drowned each year. You may also have the chance to save someone else's life. This is the way a famous swimming teacher, Soichi Sakamoto, has taught boys and girls to swim. Some of his pupils have become world champions.

To overcome fear of the water, this swimming teacher says to hold your breath and duck your head under water. Keep your eyes open and look around. This will soon overcome your fear of the water.

The next thing to do is to learn to float on your back. Wade out into the water up to your waist. Then squat down until the water comes over your shoulders. Hold your arms above your head and lean back on the water as though you were laying your head on a pillow. Then let your feet rise and—you're floating.

After you've learned to float on your back and face downward, you can swim. Begin with an overhand stroke, kicking six times to the combined left and right arm movement.

Relax. Roll your head easily from side to side as you breathe in. Move your arms and legs naturally and rhythmically.

Keep your body fairly high in the water. Your eyebrows should be about at the surface of the water. Don't bury your head deep down in the water.

Breathe in smoothly and regularly through the mouth. Breathe out through the nose, as your face turns down into the water.

Perfect your kick. Your feet should come just to the surface of the water.

Swimming in good form builds well-rounded muscles and ease of movement. It is about the best all-round sport and is lots of fun.

WHO HAVE ACCIDENTS AGAIN AND AGAIN?

Who are the persons to whom accidents happen? Do you know persons like these who have had accidents on the water, at play, in school, on the street, and at home?

The worrier who thinks only of his troubles and doesn't pay attention to what is going on around him.

The person with "a chip on his shoulder." He never wants to obey the rules of the game he is playing or do what the others in his group want to do.

The daydreamer who spends too much time in a world of his own and is not alert to what is going on around him.

The unhappy person with the "don't-care-what-happens" feeling. He barges into danger.

The impulsive person, who acts before he thinks.

The person who is always in a hurry.

The show-off who wants to show how smart and daring he is.

The sleepy person who stays up too late at night and gets overtired.

Describe the opposite kinds of persons, who usually have few or no accidents. They are the ones who also usually meet emergencies well.

GAS POISONING

In cases of gas poisoning the person's breathing is not stopped at once, as in drowning. The gas seems to "crowd out" the oxygen.

The gas that causes the most frequent poisoning is carbon monoxide. It has no color. You cannot see it. You cannot smell it. A very small amount mixed with the air you breathe makes you feel sleepy and dizzy. You may have a headache. Sometimes a person does not realize that anything is wrong until he becomes too weak to crawl to fresh air. Soon his breathing stops altogether. As you know, body cells must have oxygen. This oxygen is carried to the cells by the red blood corpuscles. Carbon monoxide combines with the blood much more readily than oxygen does. The more carbon monoxide the blood is carrying, the less oxygen it can carry. When a very large amount of carbon monoxide is present in the blood, the brain becomes affected and breathing ceases.

Carbon monoxide is given off in the exhaust fumes from an automobile. That is the reason for the warning: "Never stay, even for a minute, in a closed garage when the automobile motor is running." It is also wise to open the window of a closed car if you sit in it while the motor is running.

Gas refrigerators are another cause of carbon monoxide poisoning. Have them checked at least once a year and whenever they become noisy or have an unusual odor. Place them where air can circulate freely around them.

The gas used for heating or cooking and the fumes from stoves also cause accidents. There may be a leak in the pipe or connection. The flexible tubes of small heaters need to be checked frequently for any small cracks or holes. Such tubes are unsafe for use in bedrooms.

Unlighted gas continues to flow after the light in the burner is put out by something that boils over. The light in a burner turned low may also blow out. The gas may cause suffocation, or it may explode if a match is lighted in the room. If there is any odor of gas, the burner should be turned off at once. Do not try to stay in the room or to relight the burner. Air the room and then leave it. Some safety workers say that one should wait a half hour before attempting to relight a burner. Should the odor continue to be present after a reasonable length of time, there may be a leak. The supply of gas into the house can be shut off at the meter, and your gas company will usually send a man to check for the trouble. The open flame of a match or candle is apt to cause an explosion if gas is present; so hunt for leaks or broken connections with a flashlight.

Fumes from gas or coal stoves are dangerous unless they are carried away by a chimney or a flue. When people must work where there are fumes or other harmful gases, fans or hoods and other protective devices are used.

To rescue a person overcome by gas, you must act quickly. A wet handkerchief over your face will not keep out gas. Take a deep breath before you enter a gas-filled room, try not to breathe in any gas, and get out as soon as you possibly can. Some light gases rise. Then the air near the floor is better. This is often true when there is a fire. Since other gases are heavy, you cannot rely on crawling to be safe.

The person overcome by gas needs fresh air. In winter it is better for him to be in a room with warmed air than outdoors. Begin artificial respiration at once and keep him warm. To help rid the blood of carbon monoxide, mixtures of oxygen and another gas are sometimes given by trained men who bring special equipment for this purpose. Firemen have this equipment in their trucks. Do not wait for them, but begin artificial respiration at once and continue it until they arrive or until the person begins to breath naturally. Use the same methods as for restoring breathing after a person has been under the water too long. These methods are frequently all that is needed.

Many people think of burns as the most serious cause of injury or death from an electric current. It is true that burns may result when an electric current passes through the body. These burns should be given the same sort of first aid as are other burns. But in addition to burns an electric current may cause electric shock. In electric shock the brain and the part of the nervous system that controls breathing are injured. Breathing stops suddenly. The heart beats weakly. In serious shock the person loses consciousness and may die.

Artificial respiration must be used to help the person affected to breathe again. But first he must be freed from contact with the wire or the current. This must be done quickly but in such a way that the would-be rescuer is not injured. If the accident has happened near the switch, turn off the current. Often, however, shock comes from broken, dangling wires. Be careful never to touch the person with your bare hands or to brush your clothes against him, especially if they are damp, as they might be from rain. Wet things or metal will carry the current into your own body. Stand on a dry board and use a dry stick, dry board, or dry clothing to flip the wire away. Be careful that it does not touch you. Heavy rubber gloves would protect you still more, but they are seldom at hand when an accident occurs. The men who work on electric-light wires or telephone wires have gloves of much thicker rubber than the ones used to protect the hands in household work.

Sometimes the person must be moved instead of the wire. Protect your hands and body, or you also will receive a shock. The patient may look blue, or he may be very white. After he is freed, he may be so stiff that you think he is past saving. This is not a sign that he is dead. It is due to the action of the current. Use artificial respiration anyway.

Not every shock is serious. If you have been careless, you may have felt a tingling when you touched an electric light bulb. Although the current used in most houses is not so strong as in some other places, it is enough so that it may give you a severe and dangerous shock. You have learned not to touch electric-light switches, electric toasters, electric curlers, or other electrical equipment when your hands are wet or when you are standing in water. Cords that have become broken or badly worn may cause shocks. They may also cause short circuits and fires. It is wise to use only a good grade of electrical equipment and to keep it in condition.

Wires sometimes break loose from poles, especially after storms or when they have been weighted down by layers of ice. The person who sees such a broken wire should keep well out of its path. To prevent someone else from running into it, either send the first person available to report the break or put up some kind of warning signal and then telephone the electric company. When you do not know what kind of wire is dangling, play safe and act as if it were dangerous. Then you will run no risks.

SHOCK

Some degree of shock usually follows most injuries. Have you ever hurt your finger and felt sick for a minute? Shock may be slight and pass away in a short time. In serious injuries, especially when a person is badly frightened, has suffered great pain, or has lost much blood, shock may be severe. Notice how often first-aid suggestions mention treating or preventing shock.

Shock is a condition in which the activities of the body are slowed down or decreased. The breathing is irregular. The person may gasp for air. The pulse is rapid but weak. The temperature may drop below normal, while clammy perspiration may break out and the person may shiver with chills. He may be dull and listless. He may be nauseated.

The most important thing to do for a shocked person is to help him regulate his temperature. Put blankets or coats over and under him if he is cold. Layers of newspapers will help protect him from the cold ground if the accident occurs outdoors. He is better off in a warm room if he can be taken to one without having to be moved much. *If he seems to have fractures, do not try to move him.* If necessary, use hot water bottles, electric pads, bags of heated sand, jars or bottles filled with hot water, or whatever else can be obtained quickly. One caution: It is easy to burn a person who is unconscious. Test anything hot by holding it against your own cheek or elbow for a half minute before you use it for the victim. It may be necessary to wrap the hot water bottle in a layer of cloth or paper. *Be careful not to overheat the patient* with blankets and hot-water bottles. Overheating may be as harmful as chilling.

A person suffering from shock should be laid with his feet and legs propped up. When a person is in this position, his blood more easily flows back to his heart and brain. Do not prop up his head or use a pillow under it.

An unconscious person cannot drink. If a person is bleeding severely or has a head injury that seems to be a fracture of the skull, stimulants should not be given. Stimulants are more useful in cases of mild shock. A teaspoonful of aromatic spirits of ammonia in a half glass of water is a good stimulant. Hot tea, hot coffee, or hot milk may be used. This may be sipped or taken a spoonful at a time. Have the person lie quietly until he has begun to feel natural again.

INJURIES CAUSED BY CHEMICALS AND POISONS

Certain chemicals burn the skin. Use plenty of running water, not too cold, to wash them away. Where running water is not available, water may be poured over the skin. Cut away clothing soaked in chemicals. Then, after using the water, give first aid for burns.

Chemicals splashed into the eye should be washed out with running water or by pouring cupfuls of water across the eye while the patient lies flat. Accidents to the eyes caused by chemicals are more common in factories than among boys and girls. Lime, cement, and battery fluid, however, sometimes get into the eyes of schoolboys and schoolgirls. After the chemical has been washed out, clean olive oil or mineral oil and moist compresses should be used until a doctor can arrive.

To prevent accidental poisoning, put all bottles containing poisons in a separate, locked cabinet. Then young children cannot get at them, and no one else will mistake them for something else. In homes where there is only one medicine cabinet, the next best thing to do is to keep any poisonous substances on a separate shelf. Stick pins through the corks or seal the corks on with adhesive tape. Never take any medicine in the dark. First read the label carefully.

Poisons used as cleaning fluids, for killing insects and other pests, or for any other purpose around the house, barn, or garden should be stored in a place out of the reach of young children. Keep poisons and dangerous chemicals where they cannot be mistaken for any kind of food or medicine.

To remove a poison that has been swallowed, dilute it in a person's stomach by giving him Epsom salts in water, warm water with salt or baking soda, or soapy water. Lukewarm water alone may be used rather than taking time to hunt for anything else. Then have the person vomit. He may have to tickle the back of his throat with his forefinger, or you may have to use yours, to make him vomit.

After the stomach has been well washed out, an *antidote,** to act against the effects of the poison, should be given. A large dose of Epsom salts is good treatment after almost any kind of poisoning. *Call a doctor as soon as you can.* If the person can tell you what he has swallowed or if you find a poison container near him, tell the doctor at the time you call. He can tell you better what to do until he can arrive.

INJURIES DUE TO FIREARMS

The habit of keeping guns where children can find them is a dangerous one. Some people say that no loaded gun should ever be kept in a house or barn. Others believe that locking the gun away is all that is necessary to prevent accidents. Both children and grownups have been injured or killed by guns that were supposed to have been unloaded.

In a recent year almost half as many boys and girls 10 to 14 years of age were killed by firearms as died by drowning. In one study of school children's accidents eighth-grade pupils had more gunshot wounds than those of any other grade. Eighth graders are beyond the age of thinking a gun is only a new and interesting toy. They know that pointing any gun, loaded or unloaded, at another person is dangerous. They know how easy it is to slip off the safety catch and pull the trigger by acci-

dent. Some foolish children, however, continue to risk playing with guns.

Pupils whose fathers and big brothers go hunting may be learning to shoot. Target practice is good sport if you shoot in a place where stray bullets will not endanger other people or hit livestock. You need to learn how to handle a gun safely, how to clean it, and how to carry it. Keep the safety catch on until you are ready to shoot. Keep your gun pointed away from your own body and from houses or other people. Be careful in climbing fences and in laying the gun down. During the hunting season people who walk or live in the country need to be careful.

Air rifles and BB guns should be used in such a way that no one is hit with the pellets, which are likely to injure eyes or even to cause blindness.

INJURIES DUE TO HEAT

Heat causes burns, scalds, blisters, and sunburn. How may you prevent each of these kinds of injury? What is the proper first aid for them?

Heat also causes *sunstroke* * and *heat exhaustion.** Although these two conditions have similar causes, they affect a person quite differently and have quite different first aid.

Sunstroke is a result of too much exposure to the rays of the sun. To prevent it, keep the head and neck covered. Boys who work in the field need broad-brimmed hats. About one tenth of the fatal farm accidents over a period of eight years resulted from excessive heat. You ought not play out in the hot sun for too long at a time. Hikers and bicycle riders need to watch for signs of possible sunstroke. Rest in a cool, shady place if your skin begins to feel hot and dry. If you are in danger of having a sunstroke, you may have a headache and your heart may beat heavily and rapidly. Those who have had sunstroke at some time in the past need to be especially careful about overexertion in the sun.

When a person is suffering from sunstroke, his face is red and his temperature rises very high. Take him into the shade in as cool a place as you can find. He may be unconscious. If he is, lay him with his head higher than his body. Cool his body by removing as much of his clothing as you can and by pouring cold water over him. Use ice bags, cold cloths, or ice on his head and over his body. Put him in a cool bath for twenty minutes if it is possible to do so. Rub his arms and legs briskly toward his heart to restore circulation. Stimulants are not given in sunstroke cases, but the person may drink cool water as soon as he is conscious. It is better to keep pouring cold water over him every few minutes. Should his skin begin to get hot after he has cooled, use more cold water or ice. *A person who has sunstroke needs a doctor's care.* Keep the victim quiet for a time after he has recovered.

Heat exhaustion may be caused either by too much direct sun or by hot, moist air indoors. Heat exhaustion from either cause is more likely to occur to those who drink alcoholic beverages. People who have not been in good health or who have been eating heavy meals and drinking iced liquids are particularly susceptible to heat exhaustion.

In heat exhaustion the person is cold, not hot. The first aid therefore is aimed at making him warmer. Have him lie in a shady place with his head low. He is usually pale, dizzy, and often nauseated. His pulse is weak, his breathing shallow. He is clammy with perspiration. He may be dazed, or he may be faint. A hot water bottle over his abdomen and rubbing will ease the cramps that frequently accompany heat exhaustion. Call a doctor for the victim and give him hot stimulants as soon as he can drink.

When one perspires freely, he loses a great deal of salt in the perspiration. Drinking water replaces the fluid but not the salt. It has been found helpful in occupations where the workers are exposed to high temperatures to provide extra salt in their meals and in their drinking water. Salt tablets are also used, but many persons find that they make the stomach feel uncomfortable.

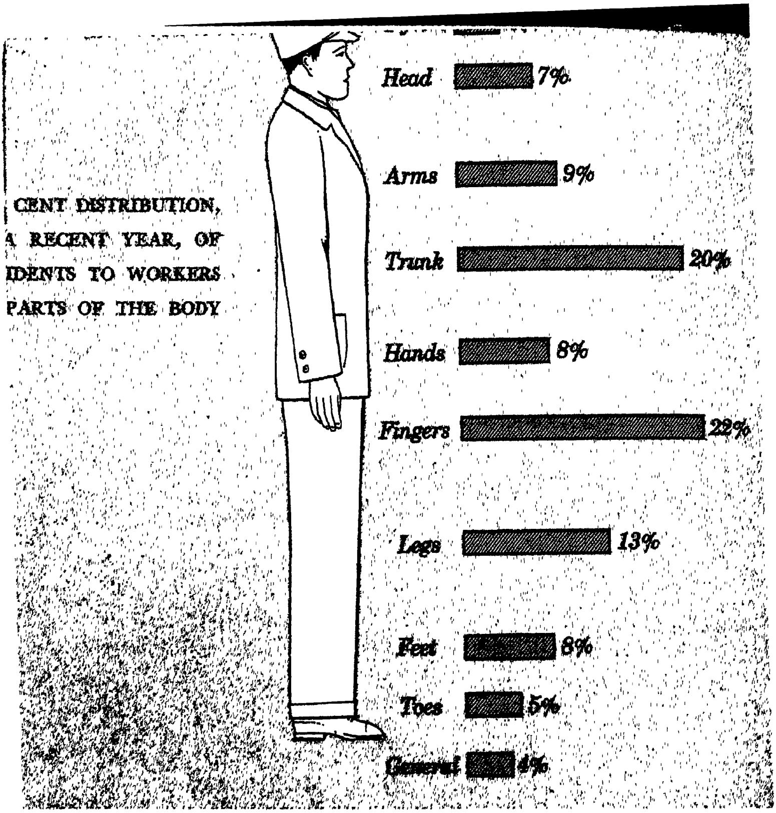
THE PARTS OF THE BODY MOST OFTEN INJURED

The feet, legs, head, and hands and arms of children are injured oftener than is the trunk. Cuts, sprains and strains, and puncture wounds, resulting from falls and stepping on nails or broken glass, cause many school children's feet to be injured. Fractures and dislocations occur when players are learning new games. The large number of accidents due to baseball and football during the junior and senior high school years shows the need of practice and good training.

Motor-vehicle and traffic accidents may injure several parts of the body. The percentages given with the drawing on page 220 show the distribution of accidents among a group of workers. Can you tell which kinds of injuries would be more likely to occur to the different parts? What general and special safety rules can prevent these accidental injuries?

WELL TRAINED NERVES AND MUSCLES AID SAFETY

Control of muscles and skill in using them help prevent accidents at all ages. The players need to learn how to play baseball and football safely and well. Beginners in any skill often take tumbles. The falls due to tripping,



CENT DISTRIBUTION,
A RECENT YEAR, OF
IDENTS TO WORKERS
PARTS OF THE BODY

climbing, and running into people or objects decrease as children learn to control their movements through trained nerves and muscles. Safety includes taking care and being courteous and considerate of others.

You need to use your eyes to see a danger before you are hurt. Your keen ears give you other warnings. When your hands are steady, you can use tools and playthings better. You will not drop or spill dangerous articles. A sure foot prevents slips and falls. Keeping a level head means that you do not become excited and helpless when you are in danger. You think your way out without delays or foolish risks. The habit of being fair to the other fellow keeps you from doing anything that would be dangerous for him.

"No, you can't try my motor bike. It's more dangerous to handle than a bicycle," said Dick's older brother.

"No, you can't drive the car until you're old enough to get a driver's license," said Bill's father.

"Be careful not to fall," Sally's mother kept telling her.

No one wants to be always worrying about accidents or to have people nag him to be careful.

So—the best thing to do is to look ahead yourself and prevent accidents that spoil all the fun. You can find the middle ground between being reckless and being too timid.

THINGS TO DO

1. Form a first-aid club or use part of the time at your safety club meetings to practice what should be done for different kinds of injuries. Ask your school nurse or a person trained in giving first aid to show you just how to bandage and to give artificial respiration. person trained in giving first aid to demonstrate kinds of bandages and methods of giving artificial respiration.

2. Write articles for your school newspaper on ways of preventing common accidents. Artistic pupils may draw pictures to illustrate safety and first aid.

3. Find what is done to make and keep swimming places in your town safe. If they are not safe, work on the problem of making them safe until it is solved.

4. Look over your own home and school for things that might cause accidents and report to the class what you have done about decreasing dangers there.

5. From your knowledge of physiology explain why you should wait two hours after eating to go in swimming. What other safety rules can you explain from physiology?

PROBLEMS TO SOLVE

1. Your Safety Council or Health Council want to decrease the number of accidents among children and young people still more. What suggestions can you give to the Council? How can your suggestions really be carried out?

2. Suppose your school has just been given a teen-age recreation room. What can be done to prevent any accidents happening there and spoiling the fun?

3. In gymnasium, some of the boys and girls get hurt fooling around before class begins or in free play periods. Some get hurt playing football. How can this problem be solved?

4. Make a cartoon or comic strip to illustrate one suggestion for safety that seems very important to you.

COMPLETE THESE STATEMENTS

Write these sentences on a sheet of paper, using the words that complete these safety and first-aid statements correctly.

1. A simple fracture occurs when (1) a bone is broken, (2) a bone is broken and comes out through the skin, (3) a ligament is torn.

2. Dislocations are (1) bones broken at joints, (2) stretched tendons, (3) bones out of place at joints.

3. First aiders should (1) set broken bones (2) protect the victim from cold, danger, and infection until the doctor arrives, (3) do nothing for fear of making the injury worse.

4. A sprained ankle should be (1) held lower than the body, (2) supported on a pillow, (3) held any way that is convenient.

5. To rescue a drowning person (1) dive in after him at once, (2) use a rope, boat, or buoy if possible, (3) wait for the lifeguard.

6. The first thing to do for a person who has been under water too long is to (1) roll him over a barrel,

GOOD FORM HELPS TO PREVENT ACCIDENTS.

(2) give him a stimulant, (3) start to give him artificial respiration.

7. A person suffocated by gas should be (1) given a hot drink, (2) wrapped in blankets, (3) given fresh air and artificial respiration.

8. The most important first aid for shock is (1) aromatic spirits of ammonia, (2) getting the person to lie down, (3) keeping the person at a comfortable temperature.

9. If a person has swallowed poison, the first thing to do is (1) make him vomit, (2) dilute the poison in his stomach, (3) try to find out what he has swallowed.

10. In treating heat exhaustion, the problem is usually to (1) raise the person's temperature, (2) lower the person's temperature.

11. In giving first aid you should (1) know what not to do, (2) always give the person water to drink, (3) carry him to the doctor right away.

INTERESTING BOOKS

AMERICAN RED CROSS—*American Red Cross First Aid Textbook*

DOLCE—*Until the Doctor Comes*

EVANS—*Everyday Safety*

GOOD LOOKS: SKIN AND HAIR

Good looks are more than skin deep. The health the body shows in the skin and the hair. The foundati of good looks is good health.

Good looks help you in many ways. You feel self-co fident when you look your best. Looking your best hel you to win friends and get the job you want.

No wonder people spend time in taking care of the hair and skin. How to keep the skin and hair healt and beautiful is important to everyone. In this unit yo will learn more about the skin and hair and some of th best ways of caring for them.

KING FINGERPRINTS. THE
NTS AT THE RIGHT ARE
LARGED

HEALTHY GOOD LOOKS

Perhaps there is nothing a girl desires more than a clear, fresh, rosy skin and shining hair. A healthy skin is one reliable sign of general good health. Boys, as well as girls, find that a clean, healthy skin free from blackheads, *pimples* * or *acne* * increases one's popularity among both boys and girls. It also gives employers a favorable first impression. What you are often shows in your face.

Boys and girls have shown their interest in the care of the skin and hair by asking the following questions:

How are fingerprints made?

What are the pores? What causes large pores?

What is sweat? What will prevent the odor from excessive perspiration?

What gives the skin its color?

What makes hair grow? Why does hair turn gray?

What causes *ringworm**? How does one catch skin diseases? What are boils? What causes pimples?

What is *dandruff**?

A few facts about the structure of the skin and hair are necessary to answer most of these questions.

HOW THE SKIN IS BUILT

Have you ever heard the skin called your "birthday suit"? The skin is the natural covering of the body. No suit you buy fits so well. The skin is seldom tight nor loose. It is a "skin fit"—a perfect fit. It protects the delicate parts of the body beneath it. It keeps out dirt. It keeps out germs. Through the nerves the skin warns you of danger and tells you of changes in the world about you. It helps to keep the body at a temperature of about 98.6° F. at all times, no matter how cold or how hot the weather is.

The outer skin is continuous with the "skin" that lines the cavities of the body. Notice that the skin covers the lips and becomes part of the lining of the mouth, where it is called the mucous membrane.

Look at the tips of your fingers. Do you see the pattern of fine lines there? Of all the millions of people in the world, no two have been found who have the same fingerprints. If you should look at part of your finger tip under the microscope, you would see on the sides of these lines tiny openings. These openings are called pores. They are the ends of little tubes, or *ducts,** leading out from the sweat glands.

Sweat, or perspiration, is coming out of the pores all the time. Sometimes on very hot days when you have been playing hard, the perspiration comes out so fast that it runs down your face. In cold weather, on the other hand, it comes out so slowly that you cannot see it at all. Perspiration is little more than salt water. It is about 99 per cent water, as you know, and .3 to .5 per cent common salt.

There are other openings in the skin besides the pores. These other openings lead from the oil glands. They pour oil on the skin. Have you ever seen skin that was very dry and scaly? The oil from the oil glands usually prevents the skin from getting dry and rough. If the oil is left on the skin, dirt sticks to it. It may settle in the openings of the pores and clog them. The oil from the glands near the hair roots helps to keep the hair glossy. It prevents the hair from becoming dry and brittle.

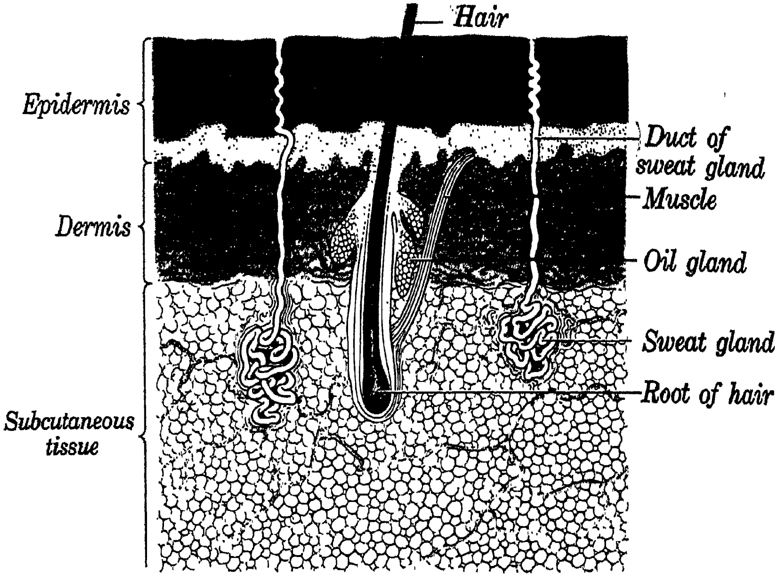
Enlarged pores may be caused by the oily dirt that stretches the pores. Or enlarged pores may be caused by a lazy skin—a skin that has not been stimulated by cold water and cold air. Enlarged pores seem to be more common during *adolescence* *—that is, the years between twelve and sixteen—than at other times of life. It is therefore especially necessary during these years to keep the skin clean so that dirt will not collect in the enlarged pores.

Have you ever noticed little white scales on the skin? These scales are dead cells of the outside layer of the skin, called the *epidermis.** The epidermis consists of a number of layers, as you can easily see in the picture on page 230. Below the epidermis you will see in the picture another layer, the *dermis.** In the dermis are the blood vessels, the nerves, and the oil glands. The sweat glands are located in the tissue beneath the dermis. The outside layers of the skin have no nerve endings in them. You can prick them with a pin and feel no pain, or you can touch them with a hot iron and feel no sensation of heat provided that the prick or the heat does not reach the dermis beneath.

The deepest layer of the epidermis is made of living cells. These cells are formed, gradually grow up to the surface of the skin, and then die and drop off in scales. It has been said that a person has a new skin every seven years. During this time all the older cells have become flattened and have been pushed toward the outside. New cells have taken their places.

It is the small blood vessels in the dermis of the skin which make cheeks rosy. These blood vessels bring food and oxygen to the cells of the skin. They carry away carbon dioxide and other wastes. Why do boys and girls who play outdoors in cold weather usually have rosy cheeks?

It is coloring matter, called *pigment,** in the deep



LAYERS OF THE SKIN

layers of the epidermis that makes a person's skin dark. In people with fair, white skins the amount of pigment is small. In people with dark skins the amount of pigment is large. Being out in the sunlight usually increases the amount of pigment. Most persons become tanned. When you become freckled, the pigment has settled in spots throughout the skin.

The hair and nails are outgrowths of the epidermis. Like the other layers of the epidermis, they have no nerve endings in them. That is why you can cut your nails and your hair without feeling pain. If the outer cells of the hair are dead, why does the hair grow? The hair grows because, although the outer cells are dead, these dead cells are pushed out by living cells growing at the roots of the hair. The fingernails protect the tips of the fingers. The hair protects the top of the head.

The skin that covers the top of the head is called the *scalp.** The hair looks smooth and glossy when the scalp is in good health. The scalp is usually in good health when it is well cared for and when the person is in good health. Dandruff is small scales or particles that flake off from the scalp. Ordinary dandruff is simply a sign that the scalp is not frequently enough massaged and shampooed. Ordinary dandruff does not call for any special treatment beyond a daily massage and a weekly shampoo. In great excess dandruff may be a sign of real disease demanding a doctor's care. Nobody knows exactly what makes hair gray. One of the B vitamins, riboflavin, seems to help prevent hair from turning gray. Keeping the scalp as healthy as possible is desirable even though it does not prevent gray hair.

YOUR RESPONSIBILITY FOR YOUR SKIN AND HAIR

There are many ways in which you can keep your skin and hair healthy, as we shall see.

1. *Keep the skin clean.* Skin specialists emphasize the necessity for keeping the skin clean. Many specialists now say that the best way to keep the skin clean, except in unusual cases, is to wash it with soap and water. They say the following treatment three times a day makes most skins look better:

(1) Make a lather of pure mild soap and gently rub it into the skin.

(2) Rinse with warm water first, then with cold water.

(3) Pat dry, very gently under the eyes. Always use an

upward movement. Never pull or stretch the skin. Pat with a smile.

Thorough cleanliness is essential in the prevention of *blackheads,** because blackheads are simply enlarged pores filled with dirt. Sometimes the oil glands secrete more oil than is needed. The oil hardens and clogs the pores. The pores become enlarged. The enlarged pores often become filled with dirt. Everyone wishes to avoid these unnecessary and unsightly blackheads. Pinching or squeezing blackheads may bruise the skin. It is likely to make the pores larger.

A warm bath every night, with plenty of soap and water, is the best means of getting rid of dirt and body odors that are disagreeable to yourself and to others. Warm water is better than hot because one may become chilled after the blood has been brought to the surface by a hot bath. If you have no bathtub in your home or if many persons have to use it, you can take a daily sponge bath.

You should of course use your own towel and washcloth. Dirty cloths and towels spread bacteria. After you have used them, rinse out the washcloth and hang it and your towel where they can dry. It is good manners and a good health habit to scrub and rinse the tub after you are through with it. Be sure you do not leave "rings" in the bathtub.

Most toilet soaps are reasonably pure. If a certain kind seems to make your skin dry, try another brand. You have already read some suggestions for buying soaps and about expecting a soap to help you keep clean rather than to perform any miracles. Unless your doctor advises you to use a medicated soap, it is better to avoid buying such kinds. Soaps with strong odors may cover body odors for a time, but they seldom destroy body odor. If the odor of perspiration is troublesome, even with the cleanest habits, harmless and inexpensive preparations, to be used on the body, may be bought at a drugstore. If the perspiration of the feet has a disagreeable odor, a *fungus* * infection may be present. If the use of a good foot powder and proper bathing does not help, you should ask your physician what to do about it.

The hands should be washed more frequently than any other part of the body, for they can easily carry germs to the mouth, nose, and eyes and to food. Every time they are washed they should be dried thoroughly. If they chap easily, use cold cream or vaseline to prevent cracks in the skin. Do not let your hands become rough and weather-beaten. Your hands often express the way you feel. A warm and friendly handshake helps to express the warmth of your personality.

You should learn to *manicure* * your nails properly and do it once a week. How do you feel when you see people with dirty fingernails? Probably other people feel the same way about you if your nails are dirty and ragged looking. The nails of the fingers and also of the toes should be washed every night. Using a nailbrush with warm water and soap is the easiest way to keep the nails clean. An orangewood stick may be used to clean under the nail and to push the skin gently back at the base of the nail. Keeping the skin pushed back helps to prevent *hangnails* * and makes the nails look neater. For appearance and for comfort, fingernails and toenails should be kept clean and properly trimmed.

If you use make-up, it should be so suitable for you and put on so lightly that people can hardly tell whether you are using make-up. The girl who is really attractive does not hide behind a mask of make-up. Using too bright nail polish, like too much lipstick, is in poor taste.

Boys do not like to go out with girls who make them feel conspicuous.

2. *Take proper care of acne.* "Oh, dear," said Alice, "I always seem to get a new crop of pimples just before a party. What *shall* I do?"

Acne, or pimples, as it is more often called, troubles many young people. Worrying about it or getting angry with someone seems to make it worse. Acne is not a serious thing in itself. But it may be more than skin deep. By worrying a teen-ager, it may make it hard for him to be friendly.

Many people have wrong ideas about acne. It is not catching. It is not caused by "bad blood." Cleanliness does not always prevent it, important as cleanliness is. The common *superstitions* * are not true.

What then is the cause of acne? During the teens, when you are growing up so fast, the glands in the skin speed up production. They pour out oil faster than the skin can get rid of it. This oil thickens and clogs up the little openings. They become inflamed. Bacteria may get in and cause small abscesses. The white heads of these abscesses, pimples, are filled with pus. Pus, as you know, consists chiefly of dead tissue cells, bacteria, and white corpuscles that had come out to fight the bacteria.

A simple treatment will bring about rapid improvement and frequently cure acne. This is the simple plan which worked in 100 cases:

Keep in good health.

Keep the hands away from the face.

Give up chocolate, cola drinks, fried foods, and nuts.

Don't use greasy face creams or an oily hair dressing.

Wash the face in this way:

  Use hot water.

  Apply a soapy lather with a soft cloth.

Leave the lather on for one minute.
Rinse with hot water.
Do this again.
Finish by rinsing with cold water.

After drying the face, apply this flesh-tinted preparation which the druggist can make for you: 2 per cent resorcinol, 8 per cent sulfur, and 11 per cent alcohol in a non-greasy base. This helps to make the skin less oily.

If you paid a skin specialist ten dollars for each visit, he would probably recommend a simple diet and a treatment like this two or three times a day.

Exercise out of doors at least an hour every day. Afternoon school athletic clubs, scouting organizations for boys and girls, walking clubs, nature-study clubs, and camping parties are popular among modern boys and girls. These clubs answer the call of the out-of-doors. You have all noticed the difference between the complexions of the outdoor boy or girl and the indoor boy or girl.

If cleanliness and healthful living do not get rid of acne, your doctor may try two other treatments: ultraviolet rays and X-rays; regulation of the glands.

Acne should be treated promptly as soon as it is noticed. Then it is not so difficult to cure. In one school where the rules for diet and cleanliness just given were followed, every case cleared up. It is not true that "there's nothing you can do except outgrow it."

That the skin may be fed by rubbing in fats or creams is a mistaken notion. It is true that just the right amount of fat stored in the under layer of the skin, the subcutaneous tissue (see page 230), gives smoothness and softness to the face. But smoothness and softness cannot be secured by rubbing creams of various kinds into the face.

A greasy cream rubbed into the skin may increase the number of pimples in two ways; (1) by adding more oil to an already too oily skin and (2) by spreading bacteria from one part of the face to another.

Many *cosmetics* * contain no harmful substances, but some of them contain substances that are poisonous and irritating to the skin. Ordinary cold creams are made from a few simple and safe ingredients costing only a few cents. A great deal of money is spent in advertising them.

3. *Prevent skin infections.* Ringworm is a communicable disease of the skin caused by a fungus that lives on the skin just as mistletoe lives on an oak tree or mold grows on a piece of damp bread. Certain kinds of ringworm infect the feet and produce what is called athlete's foot. Other kinds infect the scalp. Ringworm spreads quickly to other parts of the scalp and to other persons who use the same comb, brush, or hat as the infected person does.

These are ways to stop the spread of ringworm of the scalp:

(1) All children should be examined for ringworm. The easiest and best method of examination is by the use of special ultraviolet rays called "Wood's light." Pets, especially kittens, should be examined, too.

(2) Children with ringworm should not come to school unless every chance of spreading the infection is controlled.

(3) Children under treatment should wear a linen skull cap at all times. It should be changed twice a day and boiled ten minutes after it has been taken off.

(4) Barbershops should be required to wash combs and brushes after each use.

(5) Parents should wash a child's scalp right after each haircut.

Knowing the importance of these ways of preventing ringworm, you will help the doctor, the nurse, and your parents in carrying them out well whenever it is necessary to do so.

Bacteria are easily spread to other parts of the skin by rubbing pimples with your hand or a towel. The best way to avoid pimples, boils, ringworm, and other kinds of communicable diseases of the skin is to keep the skin unbroken and clean; to keep the hands and other objects away from the face; to use only your own towel, washcloth, comb, and brush both at home and at school; and to eat the proper food. "Fingers off" is a simple but very important rule in preventing skin infection. Squeezing a boil may force the bacteria collected there into the blood stream. The doctor should be consulted at once about any unusual *eruption* * of the skin.

4. *Give warts * and moles * proper treatment.* Although any irritant or injury to the skin may cause warts, they may also be caused by bacteria and by viruses. Frequently they disappear without treatment. Have you ever heard of any "cures" for warts? Huckleberry Finn had a cure, you remember. There are many unscientific ideas about warts. Do not pick or cut warts, especially if they grow large and sore. A doctor can remove them without danger of infection.

Moles, especially those very dark or with hairs growing in them, should be let strictly alone by everyone but a doctor. If a mole is in a place where you cannot help injuring it, you should tell your doctor about it. He may think the safest thing to do is to remove such a mole.

5. *Give your hair proper care.* The hair should be kept clean. This can be done by daily brushing and by washing it whenever it gets dirty or too oily.

Do you know how to brush your hair? Strange as this question may seem, many people do not brush their hair properly or often enough. You need a good brush with bristles that are stiff enough and long enough to reach through the hair to the scalp. It is worth while to buy a hairbrush that will last. Avoid brushes with scanty bristles, soft, short bristles, or jagged bristle ends.

Brush your hair in front with an upward movement away from the face. When you brush the hair at the back of your head, bend over, brushing from the roots out. Boys' short hair needs this kind of brushing as well as girls' longer hair. Girls sometimes fear that brushing will spoil waves or natural curls. But it is not difficult to push the waves back into place.

Brushing is good for the hair and scalp in four ways:

(1) It removes dirt, dust, and dead cells.

(2) It improves the circulation of blood in the scalp. Brushing tends to make dry scalps oilier and to make oily scalps drier

(3) It removes loose hair and makes the hair look well groomed.

(4) It helps make the hair healthy and shining.

To comb out tangles, begin at the ends of the hair and work toward the scalp as the ends are straightened. Or you can fan out the tangles sideways with the fingers.

Keep your comb and brush clean. Use soap and water and dry them in the sunlight if possible. Sunlight kills certain bacteria. Very hot water softens bristles. When you wash your hair, remember to clean your brush and comb. Remember to clean your pocket comb, too.

How often should you wash your hair? There is no one rule as to how often you should wash your hair. Some hair is oilier than other hair. Some people work where there is a great deal of dust and dirt. In summer perspiration makes the hair feel damp and dirty. After you have been swimming in salt water, you need a fresh-water shampoo. Washing hair too often or using water when you comb it seems to dry hair. Too much direct sunlight dries and streaks some people's hair. Ordinarily once every week to two weeks is about the time for a shampoo. Daily brushing removes part of the dust and oil.

Most boys and girls wash their hair at home. Here are five rules to follow:

(1) Use plenty of water that is neither too hot nor too cold. Many people prefer soft water. Hard water, as you may know, contains certain minerals. You must use more soap to make a lather in hard water than in soft water, which does not contain much of these minerals. It is easier to rinse out every bit of soap in soft water; the soap or shampoo mixture may form a curd in the hard water and cling to the hair.

(2) Use plenty of mild, pure soap that lathers well. You do not need to buy special, expensive liquids or soaps.

(3) Wash your scalp as thoroughly as your hair. Rub it well with your finger tips.

(4) Rinse your hair well and repeat the lathering. Rinse again until the hair squeaks between your fingers.

(5) Dry the scalp and hair thoroughly.

Use a clean towel to take up the dripping water; then finish the drying, in the sunlight if possible. Rapid drying over a stove or radiator is undesirable. Be sure that your hair is thoroughly dry before you go out in cold weather. A moderate amount of sunlight or ultraviolet light gives hair an attractive glossy appearance. Too much sun dries it out.

Are hair tonics necessary? Hair tonics often contain alcohol. This dries the scalp. Some tonics make an oily scalp even more oily and thus make the condition worse instead of better. People whose hair is unusually dry may rub a small amount of *lanolin* * on the scalp the night before a shampoo. Tonics do not nourish the hair. They do not cure dandruff. A clean, healthy scalp and good general health make tonics unnecessary.

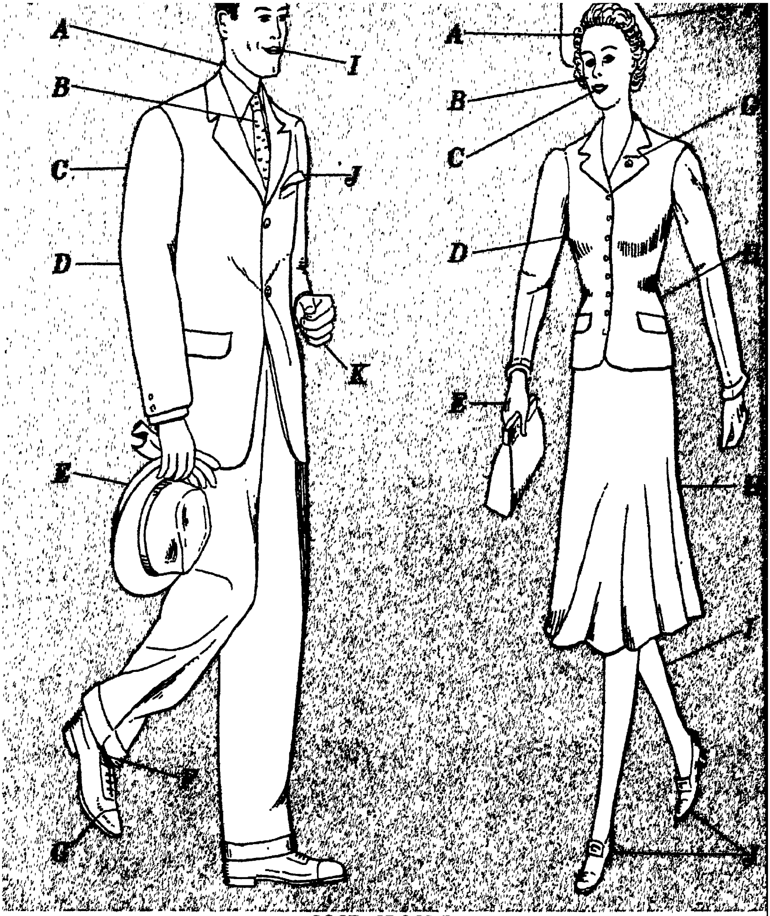
The chief value of hair tonics is that they must be rubbed in. You can massage your scalp without a tonic. Tonics alone are not of much value in making hair grow. Massage stimulates the circulation of blood. Be sure your hands and fingernails are clean and that you do not scratch the scalp. Place the tips of your fingers against your scalp, beginning at the base of the neck, and move the scalp in small circles. Try to pick up the scalp with the fingers. The so-called tight scalp, which feels as if the skin were fastened snugly to the skull, usually has poor circulation. Poor circulation and poor health may prevent the hair from growing well and also from looking attractive.

Clean, healthy hair that is neatly parted and kept in place adds much to a person's good looks. Hair should be trimmed often enough to prevent a shaggy look. The shape of your face should be studied when you decide how to comb your hair. Experiment with different hair-dos. Think twice before you have a permanent wave, especially if your hair is fine. It may make your hair brittle, kinky, and split at the ends. Keep your natural curl or wave. Straight hair has charm, too.

6. *Be careful about other details of good grooming.* Check your appearance in the mirror before you go out. Let the drawings on page 241 be your guide.

THINGS TO DO

1. The following quotations, some of them written many years ago, emphasize the importance of cleanliness of the skin. State each of them in your own words.



GOOD GROOMING

A—Collar and shirt fresh.
B—Tie fresh, well tied.
C—No body odor.
D—Suit clean, pressed, no odor.
E—Hat clean, well brushed.
F—Socks fresh, well supported, no holes.
G—Shoes shined, heels straight.
H—Hair trimmed, clean.
I—Teeth clean, no unpleasant breath.
J—Handkerchief fresh.
K—Hands clean, nails trimmed.

A—Hair clean, not too long.
B—Face good natural color or moderate make-up.
C—Teeth clean, no unpleasant breath.
D—No body odor.
E—Hands clean, nails not too long.
F—Hat well brushed, not too extreme
G—Accessories fresh, simple.
H—Dress or suit conservative, neat slip not showing.
I—Stockings fresh, seams straight.
J—Shoes polished, heels straight.

Cleanliness is, indeed, next to godliness.—JOHN WESLEY

God loveth the clean.—*Koran*

Virtue never dwelt with filth.—RUMFORD

Beauty commonly produces love, but cleanliness preserves it.—ADDISON

Self-respect thrives on soap and water.—*Cleanliness Journal*

2. Look through the papers and magazines to find soap advertisements and articles about the care of the skin. Cut these out and discuss the most interesting ones in class.

3. Girls who wish to have beautiful hands will manicure their nails once a week according to the following directions. It will take about a half hour.

First bring to your table a bowl of warm, soapy water, a nailbrush, a steel nail file or emery board, an orange stick, and a piece of *absorbent* * cotton. Then take the following steps: (1) File the nails with the nail file or emery board. Follow the rounded lines of the tips of the fingers. (2) Soak the hands in a bowl of warm, soapy water for four or five minutes, using the nailbrush to clean the nails. (3) Dry your hands. (4) Wrap a piece of cotton around the end of an orange stick and gently press back the skin around the base of the nails. Then clean under the nails. (5) Rinse the fingers in warm water again and dry them thoroughly.

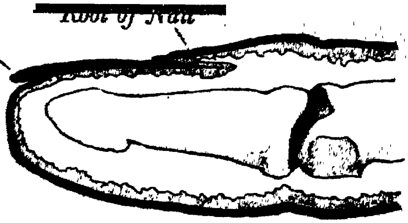
4. How should boys take care of their nails?

PROBLEMS TO SOLVE

1. Betty's father will not let her wear make-up. What are the best things for her to do and why?

a. Get angry at her father about this.
b. Don't put on make-up until she gets to school.
c. Talk it over calmly with her father and mother.
d. Do everything to have a healthy natural complexion.

2. Which facts in this section can you apply in the



CROSS SECTION THROUGH THE END OF A FINGER. THE NAIL GROWS OUT OF A FOLD IN THE SKIN.

following situations? (1) You are bothered by pimples and blackheads. (2) You wish to make a good impression when you apply for a position. (3) Your skin is pale and *sallow.** (4) You are planning a daily program for yourself with a view to improving your complexion. (5) You sunburn very easily.

Discussion Questions

Decide which of these statements should be changed to be correct. Give reasons for the changes suggested.

1. Beauty is more than skin deep.
2. Clear skin and healthy hair are not important to a boy's looks.
3. The skin is an organ.
4. The oil on the skin makes it softer and should not be washed away.
5. The outer layers of the skin are made of dead cells.
6. A warm cleansing bath each day is desirable.
7. You should squeeze out blackheads and pimples.
8. The pigment is in the outer layers of the skin.
9. To be good looking requires self-discipline.
10. Salves and greasy creams clear up a pimply skin.
11. Once a week is often enough to take care of the fingernails.
12. Perspiration is almost entirely water.
13. Hair should be washed every three weeks.
14. Soap should not be used on the hair.
15. Curls or artificial waves should not be brushed.

16. A boy's short hair does not need to be brushed.

17. In typing, attractive hands show up plainly.

18. Underclothing should be changed at least several times a week and should be aired at night.

19. What you eat makes a difference in the appearance of your skin and hair.

20. You can buy good looks.

INTERESTING BOOKS

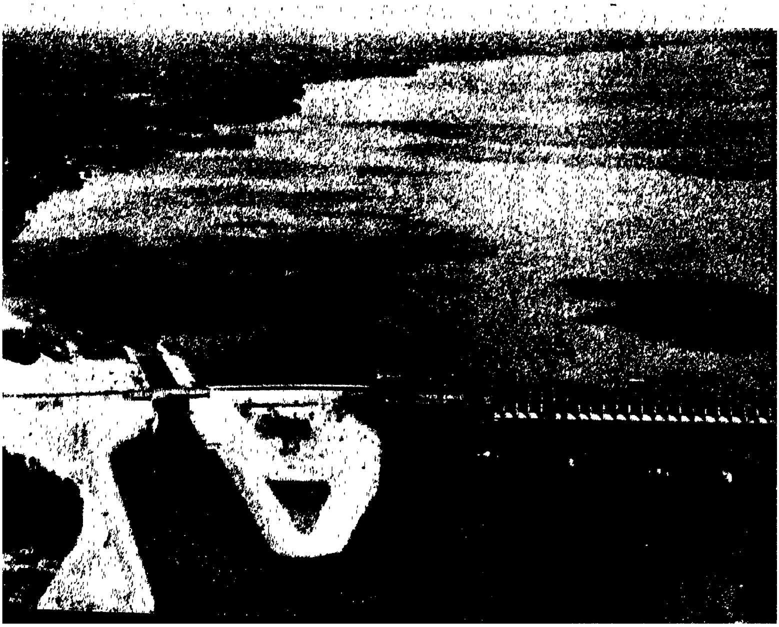
BROCKMAN—*What Is She Like?* pp. 56-77
GILES—*Susan Tells Stephen,* pp. 37-49
MCDERMOTT and NICHOLAS—*Homemaking for Teen Agers,* p. 395
RYAN—*Cues for You,* pp. 38-90
WOODWARD—*Personality Preferred!* pp. 3-45

THE TWO *C*'S

Two families of the same size earned the same amo
of money in a year. One of these families lived in a cle
attractive house, had healthful meals, looked well dres
and happy. The other family lived in a much poo
house, had poor meals, looked shabby and sickly. Wh
made the difference?

The difference was in the kinds of things that th
spent their money for, how they bought, how much th
wasted, and how well they took care of the things th
had. The first family were careful planners and buye
they were wise *consumers.** The second family were ca
less planners and buyers; they were poor consumers.

We in the United States are beginning to be m
careful in our use of soils, minerals, forests, and liv
This is what we mean by *conservation.* We have ma
much of this progress through the discoveries of scien



THE INTELLIGENT CONSUMER THINKS BEFORE BUYING.

What would you say about the two *C*'s if you had to write this unit?

The first *C* stands for *consumption.** A consumer, as you may know, is a person who uses something. You are a consumer. You use food, clothes and shoes, books, skates, the furniture in your home—you could make a long list of things you use. Each of these things must be chosen. Many of them are chosen for you, but as you grow older you make more choices for yourself. The wise consumer learns how to make good choices.

The careful consumer thinks and plans ahead. Perhaps you have your own spending money. You and your parents decide which things you are to pay for and which things they will buy for you. You may use the family supply of tooth paste and soap, for example, but buy any special manicure supplies for yourself. If your good-looks expenses come out of your spending money, the suggestions in this section will help to stretch your allowance.

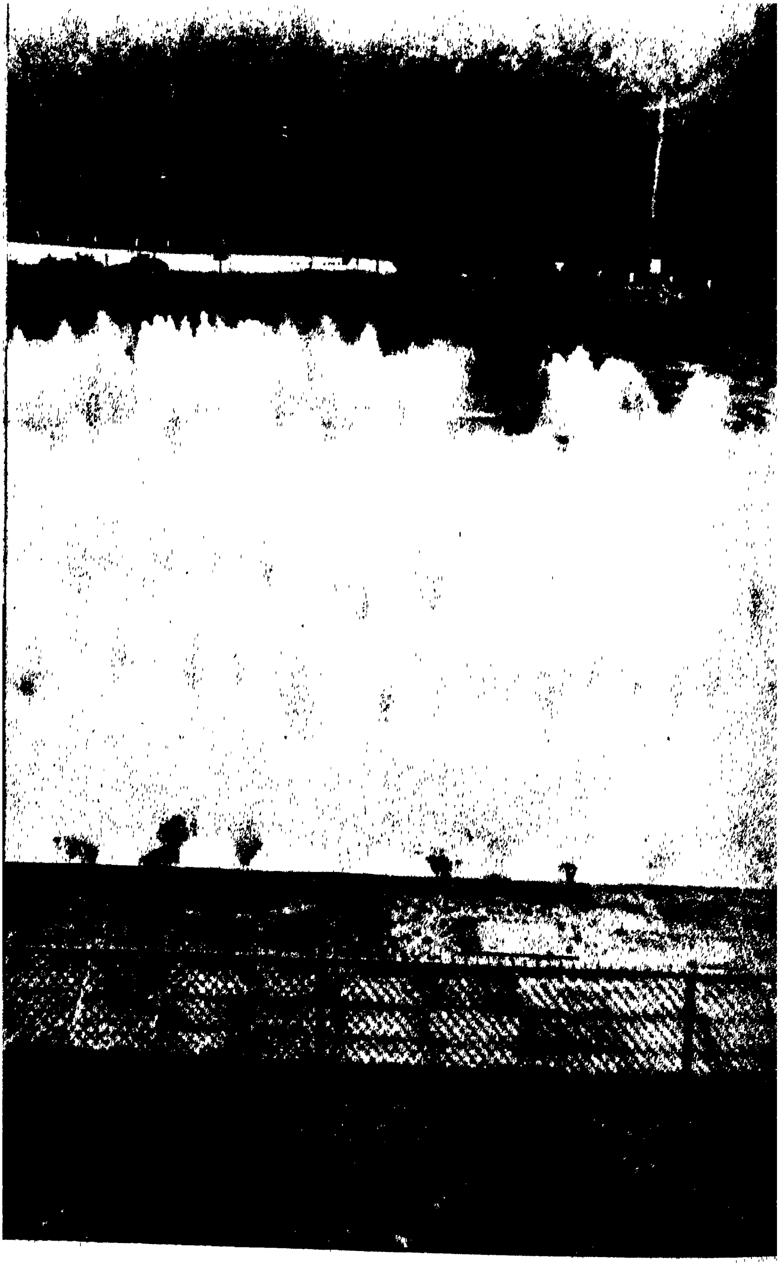
The intelligent consumer knows what to buy. The intelligent consumer also knows what not to buy. Newspapers, magazines, and television and radio programs contain advertisements of articles which have no health value, in fact no real value of any kind. Some of these articles are alcoholic beverages and tobacco in all their forms. The people who buy alcoholic beverages and tobacco pay for expensive advertising. They do shopping that has no thrift and no future. Doing a little shopping in imagination now may help you later to say, "No, thanks," when someone says, "Let's buy some cigarettes," or, "Let's have a drink."

One package of cigarettes would buy enough milk for a person for a day. One carton of cigarettes could buy a day's meals for two people at least. Fifty cents spent for one alcoholic drink could pay for some fine vegetables and fruit. Think of all the things better than whisky that you could buy with two dollars!

Much poverty is caused by spending for beer and other alcoholic beverages money that could be used to buy food, clothing, and shelter. Why do people let themselves be persuaded to waste their money by buying things that are bad for them? Perhaps they have been persuaded to buy alcoholic beverages by advertisements. In a recent year $100,000,000 was spent to persuade people to buy beer, wine, whisky, and other alcoholic drinks. One hundred million dollars spent to persuade people to buy something that might do them harm! How much food could have been bought with this money? How much medical care could have been obtained for people who needed it? How many houses could have been built?

To spend your money wisely, you need to know something about the kinds of things that are for sale. You must know which ones will suit your purposes and your pocketbook. You want things that will last a reasonable length of time and not require too much expense or trouble to keep in good condition. You know that some washable school clothes, for instance, cost less in the first place than woolens or silks. Then washable clothes do not have to be dry cleaned. After a permanent wave the hair may need setting at a beauty parlor. This increases the total cost of the wave.

The intelligent buyer makes sure that a bargain is really a saving of money. Have you ever noticed that very cheap clothing or furniture often has a great deal

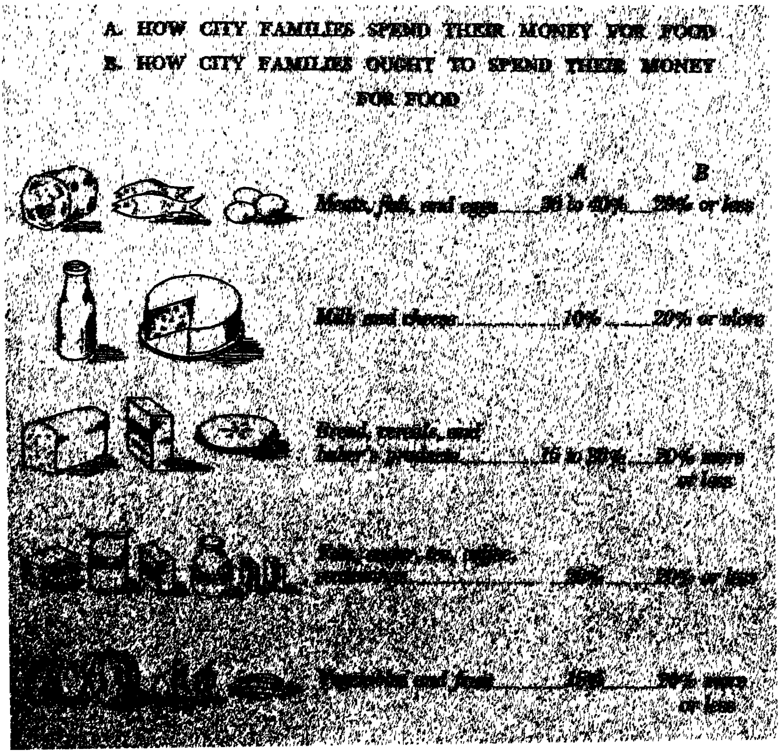


A process used in the purification of water.

of ornament? The color and the ornaments catch the unwise buyer's eye. He forgets to examine the material and the workmanship. Powders and creams in fancy boxes with names that suggest miracles sell faster at higher prices than similar powders or creams in plain boxes with plain labels.

The intelligent consumer knows when it is wise to spend a little more to get good quality. A very cheap, soft toothbrush cannot do good work. A simple dark, all-purpose dress or suit of good quality is "a better buy" than a cheaper one of poor quality.

Many families do not spend the money they have for food to the best advantage (see the graph on this page). In what ways should city families change their habits of buying food to win better health? If a family had



A. HOW CITY FAMILIES SPEND THEIR MONEY FOR FOOD
B. HOW CITY FAMILIES OUGHT TO SPEND THEIR MONEY FOR FOOD

only a small amount of money to spend, they would have to spend more on bread and less on fruits and vegetables than a family with more money. A family with children should spend as much on milk as they spend on meat and fish and as much on vegetables and fruit as they spend on meat and fish. If eggs are bought in place of some of the meat; if part of the meat is liver, kidney, and heart; if green and yellow vegetables are bought to be eaten every day; and if oranges, grapefruit, tomato juice, or cabbage is in the market basket, we know that an intelligent consumer has been buying.

The intelligent consumer goes to a store that he has found to be reliable and *sanitary*.* He learns something about brands of things offered for sale. If he is getting something to eat or drink at a soda fountain, he notices how the glasses and dishes are washed and how the clerk is dressed and handles the food. In one city eight soda fountains were studied to see how many bacteria had been left on the glasses and spoons. The lowest number of bacteria (2,800) was found on spoons. The highest number (an average of 7,000,000 germs) was found on each beer glass.

Glasses, spoons, and dishes used in public places are washed properly if they are:

1. Scraped and sorted.
2. Washed in water heated to 110° to 120° F.—that is, in water about as hot as the hands can stand. The water should contain soap or other substance to loosen grease.
3. Stacked in a basket and put in very hot (at least 170° F.) or boiling water for at least two minutes, or in a chlorine solution, to kill any germs.
4. Allowed to drain and dry.
5. Stored upside down in a clean, dry place.

If you should get a job at a soda fountain or in a lunchroom, you should see that the dishes in which you serve food are washed in this thorough way.

The person who handles food in a public place should have a clean, washable coat and clean hands. He should keep his hands away from his face and should not handle parts of the dishes that will touch the food. He should have a medical examination to be sure that he is free from tuberculosis, typhoid fever, a boil or infected wound, or other disease that can be spread by food.

If you buy at a bakery, do you know about its sanitary conditions? You know the bread smells good and the sales room looks clean. But what of the baking department and the people who work in it? How do you know a freshly baked loaf of bread has not just been handled by a baker who has a bad cold or infection? What are the health regulations for bakeries? Do you know how often your bakery is inspected? Do the workers have to have health examinations regularly? Ask your bakery man about it. Ask him if you may see his bakers at work.

Where do you buy your meat? Have you checked on sanitary conditions at the butcher's? Does he keep all his meat under cover except while he is cutting it? Does he wash off the chopping block often? Does he handle meat right after he has handled someone's money, without washing his hands first? We do not want to bother the butchers—or the bakers either—but, if they are careless, a little checking up by us may correct unsanitary conditions. Watch the butcher you buy from for a while and see whether he handles meat in the sanitary way. If you do not like what you see, tell him so. It will help him and his customers. If we are going to get better health for all, we cannot let unsanitary conditions exist.

In buying for good looks the intelligent consumer's problems are a little different from those in buying food or clothing. Cosmetics and soaps are frequently made of about the same materials no matter what the brands or names. Differences in coloring or perfume or advertising that stresses some one feature makes different kinds seem different. Of course there are some real differences. That is one reason why you have to learn how to buy wisely.

People who study consumers' problems say that much difficulty and waste of money are caused by hoping for miracles. This is particularly true in buying cosmetics, soaps, mouthwashes, and similar articles. Much of the advertising is aimed at the desire to "get beautiful quick," to be popular with other people, or to be successful in business. If you know just what you can expect of a powder, soap, or mouthwash, you will not be tempted to spend more for it than it is worth. You will buy the product and not be influenced by the advertising claims only nor by the movie star or colored pictures used to advertise it.

It pays to read labels. A few people are *allergic* * to substances used in making face powders, for example. If the substance is present, the person breaks out in a rash or becomes sick in other ways. By reading the label he can often learn what substances the product contains and avoid those products that are harmful to him. Most cosmetics, however, are now made with few substances that are harmful to the majority of people. The most common damage, someone has said, is to the consumer's pocketbook. Hair dyes and antifat cures are exceptions. They are much more likely to contain dangerous substances than powders or creams. Skin bleaches may also be harmful.

The intelligent consumer uses his time and effort sensibly, too. Which of each of the following pairs of activities, do you think is, in general, a better investment?

Doing useful part-time work for two hours a day.	Doing useful part-time work for four hours a day and the regular schoolwork, too.
Studying an hour before the evening meal and one or two hours after it.	Listening to the radio until nine o'clock and then studying.
Studying or reading or sewing as soon as school is over in the afternoon.	Playing or working out of doors after school is over.
Playing on the team right after an illness.	Resting after an illness until you are fully recovered.
Playing out of doors on a sunny Saturday afternoon.	Going to the movies on a sunny Saturday afternoon.
Driving to a roadhouse to dance.	Having a chaperoned dance at your home or school.
Spending time watching other people play or act.	Working on a hobby or doing creative work yourself.
Getting at least ten hours' sleep each night.	Staying up late to study, listen to the radio or TV, or go out with the gang.

The second *C* in the title of this unit stands for *conservation*. Conservation means not wasting. Conservation means building up and storing up supplies for future use. The ways science has aided in the conservation of health and life will be discussed next.

THINGS TO DO

1. Look up recent figures to find the amounts spent in the United States each year for cosmetics, tooth pastes, chewing gum, and alcoholic beverages. Do you think the materials bought were worth this much money?

2. There are hundreds of kinds of soaps and cosmetics. Why do you suppose there are so many kinds? Why do advertisers spend millions of dollars to sell such products? Would you buy something that you had never heard of instead of the brand you asked for? Discuss both sides of this question.

3. What are some of the difficulties in the way of your eating the right kinds and amounts of food? Is it lack of money or time? Is it poor eating places? Is it food fads or traditions you follow without thinking? Talk over some of these difficulties in class. State each difficulty clearly. Gather facts about each. Judge the value of the facts. Make a plan for overcoming the difficulty. Talk it over at home. Carry out your plan.

4. How much does it cost for a boy to keep his clothes looking neat and fresh?

5. How much does it cost for a girl to keep her clothes looking neat and fresh?

6. Discuss how much of your spending money you should set aside for amusement. Make a list of ways to have a good time without spending money.

WHAT IS FOOLISH ABOUT THESE?

1. A mother says, "I can't afford butter, but there's nothing else to take its place."

2. A teen-ager always eats until he "feels full."

3. Eating a lot of fats and oils is the best thing to do if you are skinny.

4. A person smoking a package of cigarettes a day is in no danger of getting cancer of the lungs.

5. "Sleeping pills are harmless," said Mrs. Brown, "so I'll take them as often as I want to."

6. The American people in one year spent $8,200,000,000 for education and $9,000,000,000 for alcoholic beverages. What's foolish about this?

INTERESTING BOOKS

BENNET and PRYOR—*This Land We Defend*
GLOVER—*America Begins Again*
HARK—*Make Your Pennies Count*
LASSER and PORTER—*Money and You*
MENNINGER—*Enjoying Leisure Time*
REED—*America's Treasure*
RHYNE and LORY—*Conservation of Natural Resources*

CONSERVATION OF LIFE AND HEALTH

Have you ever thought what the world would be like if there were no scientists interested in health? Long ago, people wondered what the human body is made of and how it works. This was before anyone knew that the earth is round and before it was even suspected that many illnesses are caused by plants so small that they cannot be seen with the eye alone. Sickness was a mystery. Primitive men thought it must be caused by evil spirits. Years ago, in some Indian tribes, a medicine man, dressed in a deerskin with huge horns on his head, would try to drive away the evil spirits. He was indeed such a strange and fearful-looking creature that he probably took the sick person's attention away from his pain. Some savage tribes today have medicine men, hideous in appearance, who dance, shout, and beat on drums to frighten away the evil spirits. Out of folklore and magic arose the science of medicine.

The story of the great discoveries of medical science is the story of progress in the conservation of life and health.

SOME BASIC DISCOVERIES OF SCIENCE

It was a great advance in medical science when early doctors began to look for the causes of sickness and health and to be discontented with the explanation that disease is due to evil spirits or gods. One Greek physician studied a certain sickness called the *sacred disease*. He found that food was important in its cure. "Now, if food makes the disease better or worse," he reasoned, "how can they say it is the gods who cause it? In nature all things are alike in this, that they can all be traced to preceding causes."

Many medical men and scientists in the past two thousand years have been looking for causes. Little by little they have learned how the body works. Little by little they have learned many facts about health and sickness.

Scientists now have many instruments to help them study disease. One of the most common and useful of the instruments is the microscope. Without a microscope no one can see bacteria. Body cells cannot be examined. Although lenses had been known for a long time, it was not until a hundred years after Columbus had come to America that two Dutch lens grinders made a crude kind of microscope. The Pilgrims and their families had been in Massachusetts over fifty years before the first really usable microscope was made by a Dutchman, Anton van Leeuwenhoek.

Anton van Leeuwenhoek, according to one story, was

From the days of the Egyptians and Greeks down to less than a hundred years ago there was little chance for scientists to study anatomy by examining the bodies of people who had died. In a few schools of medicine during the Middle Ages studies of anatomy were made occasionally, not by the students themselves, not by the doctor who taught them, but by an untrained helper. The students watched. The doctor pointed with a long wand while the helper did the actual cutting.

You might think that the surgeons, the physicians who operated on sick people, would have discovered much about the structure of the body. But until Pasteur discovered the relationship of bacteria and disease and until Lister found how to keep wounds from becoming infected, operations were likely to cause death. An operation was usually performed only when there seemed small chance that the patient would recover. Small operations were performed before that time of course, but seldom was a cut made into the trunk of the body. Before *anesthetics* * were discovered, most patients feared surgery more than serious sickness.

Today we think of a surgeon as a highly skilled person who has received special training after his regular medical education. In the Middle Ages surgery was looked down upon. Few doctors did even the simpler kinds of surgery themselves. Like the teacher in the medical schools, a physician might point to a spot on a sick person's body and direct a helper to do the actual operating. More frequently untrained barbers were left to set broken bones, to cut off injured arms or legs, or to perform less serious operations. Since there were no dentists, the barbers also pulled teeth. These barber-surgeons may have discovered some facts about the human body, but they were given so little education that they probably did not know which facts were new. No one would have listened to them if they had told what they had learned.

Do you know why a barber shop nowadays has a striped pole outside the door? The pole dates back to the barber-surgeons. Poles or rods have been used as symbols of healing and medicine for thousands of years. During some kinds of operations the sick person was given a pole to hold. The red of the modern pole is supposed to represent blood; the white, white bandages. Some people say that a blue stripe was added by an American barber to include the same colors that are in our flag.

For a long time progress in the study of medicine was slow. Now scientists are persons who make experiments and try to find what is true and why it is true. Several hundred years ago, however, men read books instead of experimenting for themselves. The writings of Galen, for example, were accepted as completely true for 1500 years after his death.

Galen was a Greek physician who went to Rome about 162 A.D. He knew and used some of the good ideas of other Greek physicians who had lived long before his time. But Galen, unlike some of his followers, had a great deal of curiosity. He made experiments. He studied physiology and some anatomy. He made valuable additions to medical knowledge. Unfortunately Galen seems to have pretended to know a little more than he really did. Yet hundreds of years later Galen was considered to be the one final authority on many matters of medicine. Scientists who found that Galen had sometimes been mistaken or that he did not know all there was to know about the human body often learned that it was dangerous to publish their discoveries. This same attitude of students of later years toward old Greek and Roman writers prevented advances in other ways than in medicine.

Slowly and with many setbacks modern science began to develop. Greater advances in medical science have been made in the past fifty to a hundred years than in all the thousands of years before. People in the United States live longer than they did one hundred years ago. They are better fed. Health in cities has been improved. New drugs like penicillin, the sulfonamides, and *streptomycin* * have been discovered and used. Whole blood, blood plasma, and other substances in blood have been used to save lives. *Antitoxins* * and *vaccines* * have been discovered to prevent or cure diptheria, *tetanus,** whooping cough, and other diseases. We have learned about vitamins and their importance for good nutrition. Perhaps you can best see the progress that has been made by reading about the conquest of a few diseases that used to kill millions of people.

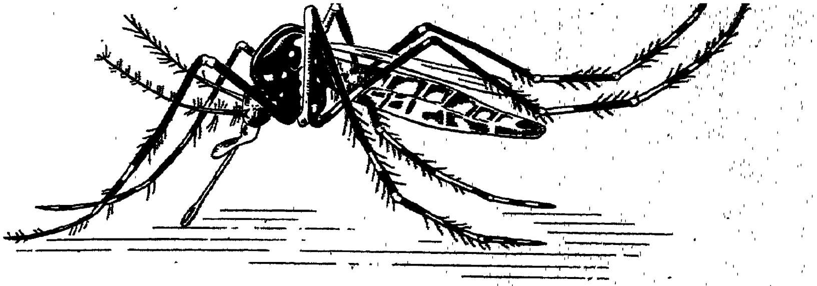
THE CONQUEST OF THE *BUBONIC PLAGUE* *

Before the cause of the bubonic plague, or Black Death, was discovered, epidemics swept Asia, Africa, and Europe. In the fourteenth century one epidemic is said to have caused the death of over sixty million people. In one city no one was left to tell the tale. All died. The houses were empty; the city was silent. People everywhere were in terror. Later, scientific studies were made. At the beginning of the twentieth century it was discovered that the plague was caused by a certain bacterium and that this microorganism is spread among rats by fleas. Back in the tenth century an Arabian physician had come close to guessing how the plague was spread. He noticed that rats and mice had come out of their holes just before the plague attacked human beings. The rats and mice, he wrote, staggered like drunken men. They were sick with the plague. Flees biting a sick rat and then biting a person gave him the disease.

With the cause of bubonic plague known, what to do next became clear. Rats were poisoned or trapped and killed. The breeding places of rats and insects were destroyed. Ships and buildings were made ratproof. People already infected were *isolated.** A vaccine was made to protect people from the disease. One of the new drugs, streptomycin, seems to be very useful in treating plague. The bubonic plague has been conquered by the application of scientific knowledge. Fear of the Black Death has been replaced by knowledge of how to prevent and control it.

During the fourteenth century epidemic the idea of *quarantine* * was tried. Guards outside the towns prevented strangers from coming inside the walls around the towns. Keeping strangers out seemed to prevent the disease from spreading although no one knew quite how it did. Venice and other Italian cities tried to keep strangers from bringing in the plague. It is said that in 1383 ships suspected of carrying infection were held in the harbor of Marseille, France, for forty days before anyone was allowed to come near the shore. Then if no one on the ship was sick with the plague, the ship could come to the shore and the passengers could come into the city.

The Italian word for *forty* is *quaranta,* and the French word is much like it. So we have adopted the word, but quarantine is used as a protection against other diseases. The length of quarantine or isolation nowadays varies for different diseases.



YELLOW-FEVER MOSQUITO

THE CONQUEST OF *YELLOW FEVER* *

Once people living in the southern states, Cuba, Panama, Mexico, and Central America never knew when an epidemic of yellow fever would descend upon them, leaving a trail of sorrow, poverty, and misery. When the disease appeared, people became panic-stricken. Many ran away as soon as they could. Today the people living in these same regions are unafraid of the great plagues that in past years spread terror. They rarely think of the terrible epidemics of yellow fever. They now live in the midst of excellent health control. This great and good change was brought about by scientific investigations that resulted in the following discoveries:

1. Yellow fever is spread by the bites of certain mosquitoes.
2. These mosquitoes become infected when they bite a person who is suffering from yellow fever within the first three days of the disease. During these first three days the organism that causes yellow fever exists in the blood of the patient.
3. The infected mosquitoes cannot transmit the disease until ten or twelve days after they have bitten the yellow fever patient.
4. A person shows signs of yellow fever within six days after he has been bitten by the mosquito.

Upon these facts the successful campaigns against yellow fever have been built. Yellow fever has been almost conquered although there is more yet to be learned about it.

There are two types of yellow fever caused by mosquitoes. One type is caught only by persons who go into the jungle or live near it. The other type is caught in cities.

During World War II there was danger of yellow fever in Savannah, Georgia. The United States Public Health Service went to work there and got rid of nearly all the mosquito breeding places. Thus they removed much of the yellow fever danger.

Although yellow fever has been brought under control, the United States health officials are careful to prevent it from being brought into this country. There is a great deal of airplane travel between this country and South and Central America. Persons who wish to fly here from places where there is any yellow fever must pass a health inspection, usually before they leave the fever country. Sometimes they are not allowed to fly to the United States until six days after they have been in any place where they might have been bitten by an infected mosquito. There is some chance that infected mosquitoes may "hitch a ride" on airplanes. Such mosquitoes and the ones that carry malaria should be killed.

New weapons against yellow fever include yellow fever vaccine, sprays containing DDT and other substances, liquids that keep mosquitoes away much better than those we used to have, and plastic mosquito netting that does not rust.

THE CONQUEST OF *SMALLPOX* *

Before the cause of smallpox was discovered, it is said that "one fourth of mankind was either killed by it or crippled or disfigured for life." Smallpox also may destroy vision. Sir William Aitkin believed that 90 per cent of the blindness found in the market places of India was caused by smallpox. As you probably know, a chain of discoveries led to the control of this disease. First it was observed that persons who had had an attack of cowpox did not get smallpox. Then *vaccination* * against smallpox by the use of material from cowpox scabs began. Though many improvements in this vaccination have been made, it is the kind we use today.

Vaccination that "takes" protects a person from smallpox for, on the average, from five to seven years. Persons twice successfully vaccinated are usually *immune* * for life. To be absolutely sure of protection, however, one should be revaccinated whenever exposure to a case of smallpox occurs or is expected. Vaccination for smallpox has, beyond dispute, proved successful.

THE CONQUEST OF DIPHTHERIA

Before the cause of diphtheria was discovered, many people believed that it was spread by "bad air" or the smell of sewer gas. Diphtheria resulted in the death of many little children. About half of those catching diphtheria died. Even those who recovered often suffered from damaged heart or kidneys. Then science came to the rescue. Diphtheria antitoxin, which was discovered in the same year that the famous French scientist Pasteur died, has greatly reduced the number of deaths from diphtheria.

By means of thousands of careful experiments performed by hundreds of scientists working for a hundred years, the cause of the disease and ways of preventing it were discovered. The following are the chief steps that have made the conquest of diphtheria possible.

1. Diphtheria was accurately described and given a name in 1828.

2. Almost fifty years later diphtheria was proved to be a disease caused by rod-shaped bacteria.

3. The next important discovery was that the bacteria produce a powerful poison (toxin) and that the body manufactures substances which make this poison harmless. These antipoisons, or antitoxins as they are called, can be produced in the blood of a horse. The serum, which is obtained from horses, is used to help the sick person fight the diphtheria toxins. When antitoxin is given soon enough, the patient is almost certain to get well. By the use of this knowledge, in thirteen years the deaths from diphtheria were reduced to one fourth the former number.

4. Almost twenty-five years passed before the next important discovery was made. In 1913 Bela Schick, a doctor in Vienna, used a very small amount of diphtheria toxin to determine whether or not a person was susceptible to the disease.

5. In 1920, after a long series of experiments, *toxin-antitoxin* * was made, which could safely be injected into human beings. The toxin-antitoxin causes the body to make its own antitoxin for a number of years. This is a simple, safe way of protecting everyone from attacks of diphtheria.

6. Within recent years *toxoid,** a toxin less dangerous but as effective in causing the body to make antitoxin has been discovered and used with great success to prevent diphtheria in children under six years of age.

As a result of this knowledge diphtheria rates have been reduced in almost every state. In one city, over a period of thirty years, the number of children who died each year from diphtheria was reduced from 2000 to 86.

Even the 86 deaths were unnecessary. New Haven, Connecticut, then a city of 162,000 people, had a three-year period without a single death from diphtheria. Medical science has made such advances that the control of diphtheria is now within our reach.

Fear of many diseases has been replaced by knowledge of ways of preventing them.

NEW CHEMICAL WEAPONS AGAINST DEATH

From science laboratories during recent years have come many new chemical cures for certain diseases. These are important "helps to health."

Deaths from pneumonia were reduced from 100,000 to 25,000 in one year by *sulfa* * drugs. When these drugs work, they work quickly. During the winter of 1943-1944 a large number of men in the Armed Forces were divided into two groups — one group who took sulfa pills daily and a like group who had no sulfa pills. In the group who took the sulfa pills "strep" *infections** were reduced 75 to 90 per cent; certain kinds of pneumonia and colds were cut down more than 50 per cent; rheumatic fever was reduced about 75 per cent; and epidemics of *meningitis** and scarlet fever were checked.

But sulfa drugs may have bad effects on some people. They may damage the kidneys. For this reason these drugs must be given carefully under the doctor's observation, with frequent blood tests to see how the drug is acting. When used again and again, the sulfa drug may no longer work because bacteria have built up resistance to it.

Then another new kind of drug comes to the rescue. These are the *antibiotic** drugs. When sulfa fails, these antibiotics may succeed.

Penicillin was the first of the antibiotics to be discovered. Dr. Alexander Fleming, who was born in Scotland, had spent years searching for a really good germ killer — one that would kill harmful bacteria without hurting the human body. One day he noticed a mold on one side of a flat dish in which he was studying germs. No germs were alive near the mold. He looked at the germs through a microscope and saw them die. The mold was killing them. This was the beginning of many experiments that led to the present use of penicillin as a medicine. It is effective in the treatment of pneumonia, scarlet fever, and tonsillitis.

When penicillin failed to kill certain germs, another antibiotic came to the rescue. Another scientist, Dr. Selman A. Waksman, spent twenty-eight years hunting for this chemical weapon. He found it in the ground, and called it *streptomycin.** This drug is useful in curing pneumonia, dysentery, whooping cough, and some forms of tuberculosis.

If both penicillin and streptomycin fail, three other drugs — *terramycin,** *chloromycetin,** and *aureomycin** — may be tried. They have been effective with typhus fever and spotted fever also.

All of these antibiotics, however, have a bad side. They are harmful to some persons. Penicillin, for example, may cause a skin rash, and streptomycin causes deafness in some people. These medicines should never be used except under the direction of a physician.

New drugs for the treatment of malaria have also been discovered and tested. During World War II *atabrine,** another chemical drug, was used successfully where mosquito control was impossible. Some new drugs have been developed that are even more effective than atabrine in treating malaria.

One September day in 1948 a wonderful thing happened at the Mayo Clinic in Minnesota. A woman who had been a helpless cripple walked without pain. A new medicine, *cortisone,** had cured her of *arthritis.** For eighteen years Dr. Edward C. Kendall had been working to make this new drug, which has brought hope to millions of people. But it, too, must be used under a physician's direction.

Most wonderful of all are the new "blood medicines." From the blood given by healthy persons, these new medicines are made. The whole blood is used to replace the blood a person has lost in an accident. It is also used in the treatment of *anemia.**

Another part of the blood, *serum albumin,** found in *plasma,** the liquid part of the blood, can be kept a long time, takes up little space and, so far as we now know, does not harm the person to whom it is given. A doctor or first-aid man can carry in his pocket enough to save a life. All he has to do is add sterile water to the serum albumin.

Another substance found in plasma contains antibodies to fight diseases. One important use is to prevent very young or weak children from having measles, or at least from having a severe case. Two other substances, *gamma globulin** and a vaccine developed by Dr. Julius Salk, may make polio as rare as smallpox.

Another part of the blood is used to test blood that has been given to a blood bank to find out what type it is. Although all human blood looks alike, it may be of four different types. It is important to know what type of blood is being used. The blood type given in a transfusion should match the patient's blood type. If the wrong type of blood should be used, the patient might die.

These are only a few of the blood medicines. There are more than eighty different parts of the blood. Our blood, rightly used, can save others; others' blood can save us. Blood is full of great new medicines.

THIS ATOMIC AGE

When the atomic age is mentioned, most people think of the atom bomb. But the energy locked up in a half pound of any substance can be used to cure as well as to kill. Already our knowledge of atomic energy is being used for better living.

Substances that have been made radioactive by atomic energy are now being used as health detectives and as medicine. The radioactive elements, called *radioisotopes,** or tracers, are put into the human body to detect causes of disease. Radioisotopes are being used to study cancer and heart trouble, our two greatest killers.

Through these tracers we have learned that all the cells of the human body are replaced every three weeks. New cells are taking the place of old cells all the time. We are learning more about how a wound heals and how green leaves of plants turn sunshine into food for us. Some day these radioactive substances may make the earth a place where there is plenty of food, comfort, and health for all the people upon it.

The search goes on. In laboratories all over the world scientists are studying the causes of sickness and of health. They are still puzzled about many things. But new discoveries are being made all the time.

You can gain new health knowledge from reports in reliable newspapers and magazines. Sometimes these new discoveries are dramatized over the radio. Some have been made into thrilling motion pictures such as "Yellow Jack." The more facts you know, the less you will be misled by advertisements of useless or harmful "cures," sold at from five to a thousand times their actual cost.

TAKE A LOOK AT YOURSELF

The oldest medicine in the world is faith and "the will to live." Many persons for whom there seemed to be no cure have lived. "Incurable" cases have been cured.

This is because much sickness stems from the mind. Our feelings affect the way our body works. There is a name for this influence of mind on body and body on mind. We call it *psychosomatic.** *Psycho* means *mind* or *soul; soma* means *body*. Psychosomatics is an important field of medicine.

What are some of the feelings that help us to keep well? Which of the following are happy feelings you can have?

"I'm not a beauty, but I have a pleasant smile, good posture, and lots of pep. I'll make the most of my good points."

"I like to help people feel successful and happy. That makes me happy, too."

"When I do my best, I don't worry about my school work."

"When I play with my little brother a few minutes I feel happier than when I get angry with him for bothering me."

"I am learning to make grown-ups understand me and listen to me — I find out when they're ready to listen."

"I can't play ball as well as Bill, but when it comes to shopwork, I'm pretty good."

When your body is working at its best, you feel as the school boy did who said, when he was walking through woods in autumn, "It's great to be alive!"

CARE OF THE SICK

With all our knowledge of how to keep well, there may be times when someone in your family is sick. If that person is your mother or other grown-up, you may have to be the nurse. Of course, the doctor is in charge and you will follow all his directions carefully. Knowing how to take proper care of the sick makes you a person of importance.

Suppose now that you have a patient with a bad cold and fever. Since nothing feels better than clean sheets when you are sick, have a fresh bed for your patient. The room seems more restful when it is in order. So straighten it up. Move the bed so that the light will not shine in his eyes.

If you have a clinical thermometer, you can take the patient's temperature. To do so requires only two or three minutes. If his temperature is high, it is better not to mention it. He might worry about it. Keep a record, though, for the doctor will want to know.

Fix the windows so that the air will be fresh but without drafts. Give the patient a covered pitcher of water and a glass so that he can take a drink whenever he feels thirsty. Then leave him alone to rest.

After his nap bring him some orange, grapefruit, or tomato juice. He can have a glass of fruit or vegetable juice between meals.

For lunch he can have a cup of any good hot soup. Maybe he will feel like having a glass of milk, too, or a cup of custard or junket. Put it on a light tray covered with a clean napkin. Make the food as appetizing as possible. Before you hand the tray to him, help him sit up in a comfortable position with pillows at his back. Do not go any closer to him than you can help. You do not want to pick up some of his cold germs. He should be careful, too, to catch his coughs and sneezes in a paper handkerchief and then put it in the paper bag you have pinned to the bed where he can reach it easily. When he has finished his lunch, give him a damp cloth and towel so that he can wash his face and hands a little. Then leave him to rest and sleep if he can.

Wash your own hands and face right after you have left the sickroom. Wash the patient's dishes with hot, soapy water and rinse them with boiling water. That will kill any germs on them.

By the third day his temperature is back to normal. Now he can have a "light diet" instead of a liquid one. Milk toast would taste good to him this cold morning. That and fruit juice will be enough for his breakfast. Keep on with the fruit juice or water between meals. For dinner he can have a small piece of meat, a baked potato, a green vegetable, and fruit jello. For supper cream of celery or other vegetable soup and a cup custard would be good.

The next day he can get up and stay anywhere in the house where he can be at an even temperature. He may even sit in a warm, open, sunny window and let the sun pour down on his face and hands.

Always try to be cheerful and move about the room quietly like a professional nurse. That helps the patient to get well quickly. After the first day he will enjoy the stories you read to him. He will be glad not to have to make the effort to talk to you much.

Any patient is lucky who receives the kind of care we have just described.

THINGS TO DO

1. Read about some scientist who has aided in the conservation of health and life. Report to the class what that scientist discovered.

2. Make a collection of health superstitions some people still believe. Discuss these and, if possible, give the scientific point of view for each one.

3. Work with a committee to find out about tuberculosis and its control in your local community. Visit the local health department to find out how many cases of tuberculosis there are. Visit other organizations that are concerned with tuberculosis. Find out what they are doing to prevent and control it—*tuberculin* * testing, *BCG vaccine,** X raying, nursing, and clinic and sanatorium care of tuberculosis patients.

4. Make a cartoon about one idea on conservation that seems especially important to you.

PROBLEMS TO SOLVE

1. How can you have a good time without spending money? Have the most expensive trips and parties been the most fun? Which of these inexpensive ways of having a good time would be the most fun for you:

- An outdoor skating party
- A hike and campfire supper
- A swimming party at the beach or lake with picnic lunch and games
- A school party in which you (a) find your partner by matching two halves of a picture, (b) have a "grand change" or circle dance to get new partners, (c) play charades and other guessing games, and games of skill like table tennis, balloon games, and dart throwing.
- A treasure hunt
- A TV, radio, or record-playing party

Of course, the success of any party depends on people doing their share and entering into the fun wholeheartedly.

2. One traffic court judge said that alcohol plays a part in at least 90 per cent of holiday auto accidents. How do you explain this? What can be done to conserve human life by reducing the number of holiday accidents and the accidents caused by drivers who have had "one or two beers" or cocktails or whiskey?

CHECK YOUR KNOWLEDGE

Correct any of the following statements that need changing. (Do not write in this book, but copy the correct and corrected statements in your health diary.)

1. Medicine men were real doctors who cured disease.
2. Van Leeuwenhoek discovered that bacteria cause disease.
3. Some people are still superstitious about health.

4. It is easy to control a disease as soon as the cause is discovered.

5. More scientific discoveries have been made during the past fifty to a hundred years than were made in thousands of years before that time.

6. No one needs to be afraid of smallpox, yellow fever, or other diseases that have been brought under control.

7. A reliable doctor keeps himself informed of new treatments and discoveries, but he waits to use them until they have been tested.

8. It is dangerous to rely on patent medicines to make you well.

9. Everyone in this country has good medical care.

10. Healthy people have no need of doctors.

11. Conservation of the soil, forests, and water supply is very important to health.

12. Cancer detected early can be cured.

INTERESTING BOOKS

AMERICAN RED CROSS—*Red Cross Home Nursing*

BAER—*Pandora's Box*

ELLIOT—*Conservation of American Resources*

NATIONAL ASSOCIATION OF SECONDARY-SCHOOL PRINCIPALS—*Consumer Education Study Series*

NORLIN and DONALDSON—*Everyday Nursing for the Everyday Home*

PARKER and DOWNING—*Community Health*

PARKER and FRYE—*Water Supply and Sewage Disposal*

SENSE—*America's Nutrition Primer,* pp. 56-84

U. S. DEPARTMENT OF AGRICULTURE—*Fight Food Waste in the Home*

WINGATE, GILLESPIE, and ADDISON—*Know Your Merchandise*

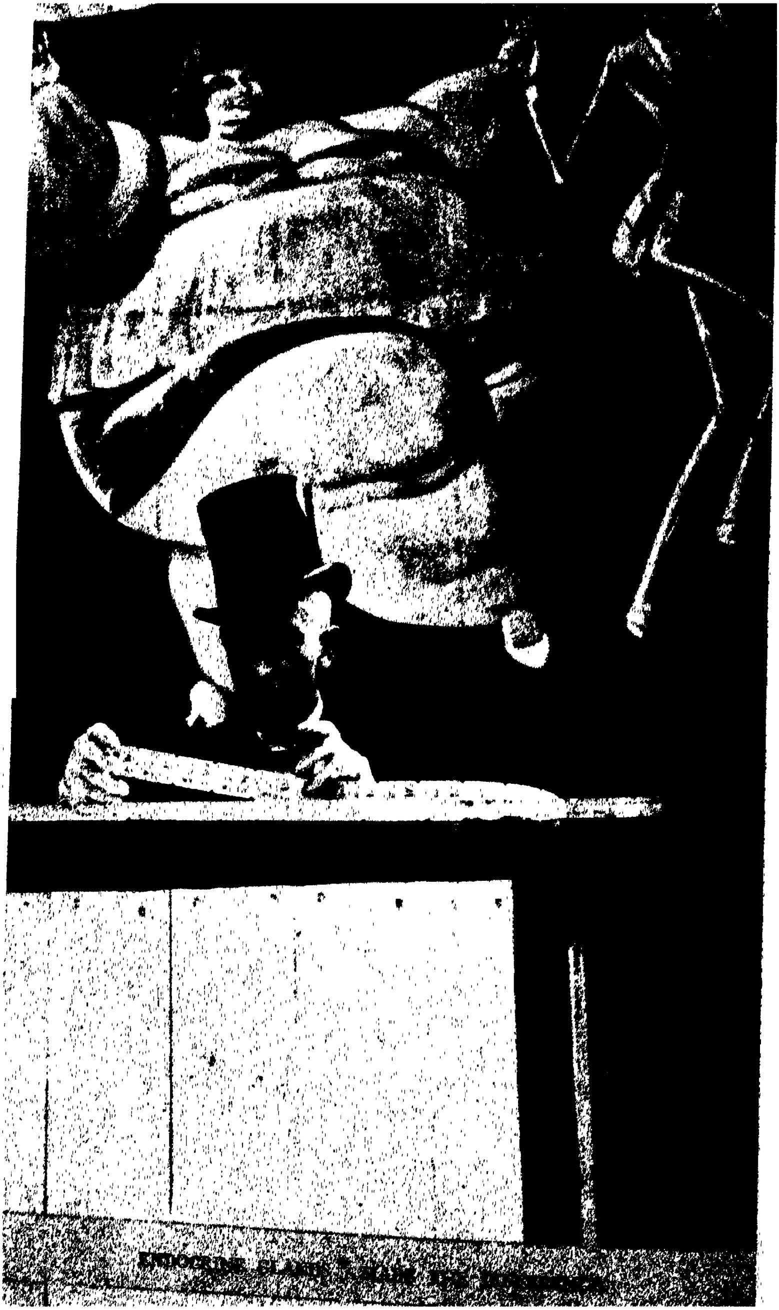
CONTROLS OF THE BODY

Can you steer yourself as a person steers a boat? C you lay a course and keep to it? Or are you driven forces not under your control?

There are two kinds of inner controls about which y have to do very little. These are the glands of inter secretion and the autonomic nervous system. These t controls protect you and prepare you for danger. T body changes they cause often annoy or embarrass yo

Another kind of control makes it possible for you move or rest in ways you want to or ought to. Th is the *central nervous system.** By means of messag flashed from the brain through the nerves, you can co trol your muscles so that you can walk, run, dance, wr a letter, or relax at will.

In this unit you will learn about these three kinds controls and how to handle your emotions.



THE GLANDS OF INTERNAL SECRETION

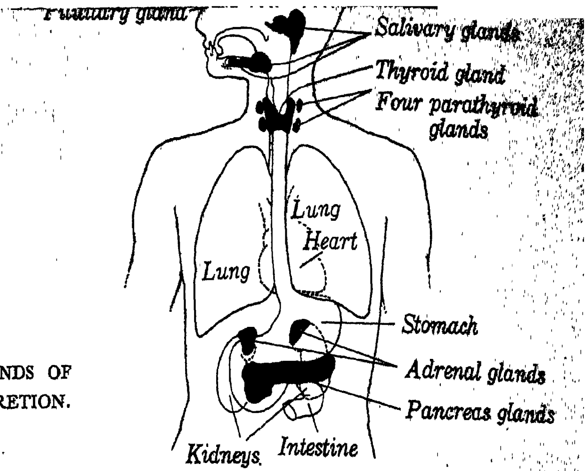
You have studied about certain glands such as the salivary glands, which pour saliva into the mouth. You know that secretions from glands in the stomach and intestines help to digest food and that the sweat glands in the skin secrete perspiration and the oil glands in the skin secrete oil.

How are the glands of internal secretion (also called the endocrine glands) different from the glands with which you are familiar? In the first place, the glands of internal secretion pour their fluids into the blood or lymph stream. The blood carries these chemical messengers to all parts of the body. That is why they can produce such marked changes in the body as a whole. In the second place, very small amounts of these internal secretions produce very great changes. For example, it takes very little extract from the *thyroid* * gland to make the difference between a well-developed baby and a stunted, deformed little creature.

Glands known to secrete chemical substances that are poured directly into the blood stream are the *pituitary,** thyroid, and *parathyroid* * glands, certain glands in the pancreas, and the adrenal glands. The names and location of these glands of internal secretion are given in the diagram on page 280.

THE PITUITARY GLAND

Experimental work has shown astonishing changes in animals due apparently to the pituitary gland, a gland only about the size of a large pea that lies at the base of the brain. This gland, like the other endocrine glands, pours its secretion directly into the blood stream. It is



ND THE GLANDS OF TERNAL SECRETION.

the leader of the "endocrine orchestra." Too little secretion by the pituitary gland may cause a child to become a dwarf—a man or woman in miniature. Too much secretion of the same gland may make a person a giant. Giants and dwarfs grow that way because their pituitary glands are not working properly. The bearded lady, the fat lady, the giant, the dwarfs, and many other freaks that you may see in the circus are suffering from disturbances in the secretions of some of the glands of internal secretion.

But more important than the cases in which the glands go wrong is the daily work of healthy endocrine glands. They help each cell to perform its duty as part of the whole. They tell certain cells to work faster; they let others slow down. Over all the other endocrine glands is the general, the pituitary gland.

THE THYROID GLAND

The thyroid gland, as you can see in the diagram, lies like the letter "H" across the front of the larynx and windpipe. In older children and adults these three disturbances of the thyroid gland commonly cause trouble: (1) too much, or an oversecretion of, thyroid extract, (2) too little, or an undersecretion of, extract, and (3) a special diseased condition of the gland.

When the thyroid gland is overactive, food is in some cases burned up in the body twice as fast as in the normal person. When the thyroid gland is defective or deficient, as in *cretinism,** the body fires burn low. The thyroid gland uses the *iodine* * in food and water. Lack of iodine affects the way the gland works.

Diseases of the thyroid gland must be treated by an expert physician. An enlargement of the thyroid gland in the neck (*goiter* *) does not always indicate a lack of thyroid secretion. Certain tests must be used to find out exactly what the difficulty is.

If the extract of the thyroid gland is given in large doses to healthy individuals, it makes the heart beat faster, even causing violent palpitation of the heart. It also causes food to be burned more rapidly and extra fat to be used up. For this reason antifat cures sometimes contain thyroid extract. These antifat cures may reduce the fat, but often at the same time they cause a serious disturbance of the health. This is one reason why antifat cures should be avoided.

The use of the thyroid extract in treatments should never be undertaken except on the advice of a physician who understands the endocrine glands. One endocrine gland works with others. A change in the secretion of one gland may speed up or exhaust others. Moreover, tissues may respond differently to the same amount of secretion. That is why it is difficult even for a doctor to tell from the signs and symptoms exactly what is wrong and how much thyroid extract should be given.

THE PARATHYROID GLANDS

Near the thyroid gland are four tiny parathyroid glands. The parathyroid glands help to regulate the use of calcium in the body. If the parathyroids do not secrete their special substance, the person's muscles may be affected.

THE PANCREAS

About two hundred years after Columbus discovered America a scientist in his laboratory noticed that, if a certain organ, the pancreas, was removed from an animal, the symptoms of the disease we now call *diabetes* * appeared. In diabetes some of the food eaten, instead of being used as fuel, is carried as sugar in the blood in larger amounts than usual. Much is lost in the *urine.** The person usually becomes thin. He may be unusually thirsty because his kidneys are overactive.

In the years following 1683 scientists kept working on the problem of the cause of diabetes. Little by little they obtained proof that a certain part of the pancreas secretes a substance that regulates the use of fuel by the body. This substance is called *insulin.** It was not until 1921 that Dr. Frederick Banting, working with other scientists in the laboratory of the University of Toronto, succeeded in making insulin. If the diabetic patient is given insulin, he can burn his sugar as fuel. Insulin has made possible the control of diabetes.

Insulin has saved the lives of many children. It works miracles. A child having diabetes, practically nothing but skin and bones, in a few weeks after starting the use of insulin may come to look perfectly healthy and may continue to grow and put on weight as long as insulin is given daily and the diet is properly controlled. In many cases a well-balanced diet appears to lessen the chances that a person will have diabetes. Older people, for example, who are overweight as a result of eating a great deal of rich food for many years seem to be more likely to have diabetes. Older people who have eaten more wisely and have kept within the limits of more nearly normal weight seem to be able to store and use their food without becoming diabetic. In adults diabetes comes on slowly; in children usually rapidly.

THE ADRENAL GLANDS

The adrenal glands are two small glands placed like little caps on the kidneys. Parts of these glands secrete a substance that helps the body to meet sudden dangers—running away from an enemy, for example. The substance secreted is called adrenin. It is poured into the blood stream and races through the body, making the heart beat harder; decreasing the size of the capillaries, especially in the arms and legs; stimulating the sweat glands; slowing the digestive movements; decreasing the flow of digestive juices; making the hair stand on end; and causing the liver to send an additional supply of fuel to the muscles. All these changes put the individual in a condition in which he can run faster, fight harder, and scare his enemies.

Adrenin is secreted when you become very angry or frightened or are in other situations in which you need increased power. Primitive people needed this protection when they met their enemies or wild animals or in other emergencies. It is clearly not desirable to produce all these bodily changes uselessly or too frequently, because digestion is interfered with and stores of energy are used up. Anger and fear tear down; happiness and contentment help to build up the body.

PRESENT LACK OF KNOWLEDGE ABOUT THE GLANDS OF INTERNAL SECRETION

There is still much to learn about the glands of internal secretion. The secretions from some of these glands affect other glands. A part of one gland produces one effect; another part of the same gland may have an entirely different effect. At the present time no one knows so much as we should like to know about all the effects that taking a certain gland extract may have. Scientists who have experimented a great deal with the endocrine glands are very cautious in giving gland extracts to patients. If they do give these extracts, they usually give small amounts at first and watch the results closely. A person who is being fed glandular extracts should follow the doctor's directions carefully. It is important that just the proper amounts should be taken at just the proper times.

If a child shows signs that his glands of internal secretion are not doing their work, he should be taken to a doctor who has been trained to treat glandular disturbances. To wait to see if the child will outgrow the condition is unwise. When treatment is begun early, the chances for improvement are better. Much can be done by proper medical treatment. By giving the extracts needed, changes have been made that would once have been called magic.

The use of any kind of gland extract in the treatment of ill health should be left to physicians who have studied this subject extensively. We should avoid taking any kind of gland preparation that may be advertised or any other preparations, such as antifat cures, that may contain some gland substances, except as directed by a physician. In some cities no one can buy glandular extracts without a prescription from a doctor. This is a wise rule because it may be as dangerous to try to doctor yourself with such extracts as it would be to let a child play in an automobile when the motor is running.

Although we do not yet know exactly how the glands of internal secretion work together, some of them seem to "call the signals" somewhat like a quarterback in a football game. But the whole team must be in good condition and play together to have a good game.

The secretions from the endocrine glands affect the growth of the body, as we have seen, and the circulation, the digestion, and other activities of the body. Too much or too little of certain secretions may also make a difference in the way a person feels. A person who is dull, irritable, or slow to learn may be suffering from some change or lack in glandular secretion. Energy, happiness, and attitude toward other people depend in part upon the small amounts of substances manufactured by these important glands.

You have some responsibility for the good working of the endocrine system. These glands go wrong if you do not eat the right food. Calcium and phosphorous affect the work of the parathyroid glands. Iodine is necessary for the thyroid. Lack of vitamins seems to upset all of the endocrine glands. You can help these glands to work well by eating the right kinds and amounts of food.

The glands respond to your moods. If you are angry, the adrenal glands become more active. Worry and grief probably influence the glands, as they do other organs of the body. Health and happiness are twins; they are usually found together. Anything that you can do to improve your general health will make the glands of internal secretion, as well as all the other parts of the body, work better. Learn to handle feelings of anger and worry.

PROBLEMS TO SOLVE

1. Charles was going to have a test in school one day. In the morning he said, "I feel sick at my stomach. I don't think I can go to school today." How do you think Charles might have felt if he had:

been attentive in class?
answered correctly and asked good questions every day?
done his homework thoroughly?
reviewed for the test the day before?
felt that he was well prepared and would do his best on the test?

Being prepared gives us self-confidence. Feeling secure and confident helps our mind work well.

2. Mary Ann had a headache. It came late one afternoon just before the school party. Her father, who was a doctor, could find no cause for the headache. Might Mary Ann's headache have been prevented if:

she had looked forward to having fun at the party?
she knew exactly what to do and say to boys and girls at the party?
she were not afraid that no one would choose her for a partner?
she had not felt that her dress was old-fashioned?

3. Florence and her mother were arguing about her coming home late to supper. Her mother did all the talking. Florence never got a chance to say anything or to tell her side of the story. This made her angry, and then her mother told her to go up to her room and stay there. How might Florence have handled this situation without getting so angry and emotionally upset? Try to role-play the part of the mother or Florence to show how the situation might have been handled.

4. Anger, fear, joy are emotions. They are feelings caused by certain things in you and in your environment. What makes *you* happy? How can you plan to have more happy feelings? Love and affection are emotions. What

are the things which make you like people? What can you do to make people like *you?*

COMPLETE THESE SENTENCES CORRECTLY

Copy these sentences in your health diary, selecting the ending which will make each statement correct.

1. The endocrine glands pour secretions (1) into the stomach and kidneys, (2) directly into the blood or lymph stream.
2. The amount of internal secretion needed to produce great changes in the body is (1) large, (2) small.
3. The ductless glands (1) affect one another's activity, (2) have no effect upon one another.
4. Lack of insulin causes (1) goiter, (2) diabetes.
5. A person who seems to have too much or too little glandular secretion should (1) buy gland extracts he has heard about, (2) wait to see if he outgrows the condition, (3) consult a doctor.

THE AUTONOMIC NERVOUS SYSTEM

The second system of inner control is the autonomic nervous system. The glands of internal secretion and the autonomic nervous system work closely together. They regulate the speed at which every cell or organ works.

The autonomic nervous system acts without directions from the thinking part of you — the brain.

Why does your face flush when you are hot or angry?

Why do your hands perspire when you are nervous?

Why does your throat feel dry when you have to get up before a large group and make a speech?

Why does your stomach feel upset or fluttery when you are afraid or anxious?

Why does your heart beat fast when you are afraid?

Why do your muscles feel ready to run or to fight when you are angry?

These things happen without your wanting them to. Your autonomic nervous system has taken control and sent messages to the glands; to the muscles of the heart, lungs, and other organs; to the blood vessels; and to the skin.

There are two parts of the autonomic nervous system, which do these very different kinds of work:

Parasympathetic System	*Sympathetic System*
Protects the eyes from too much light by sending a message to make the pupils small.	Increases the secretion of the adrenal glands.
Starts and increases the flow of digestive juices.	Stops or decreases the flow of digestive juices.
Helps in digestion and elimination of waste by making the muscles in the digestive tract contract at the right time.	Relaxes the muscles of the digestive tract.
Keeps the heart from beating too fast.	Speeds up the heart beat.

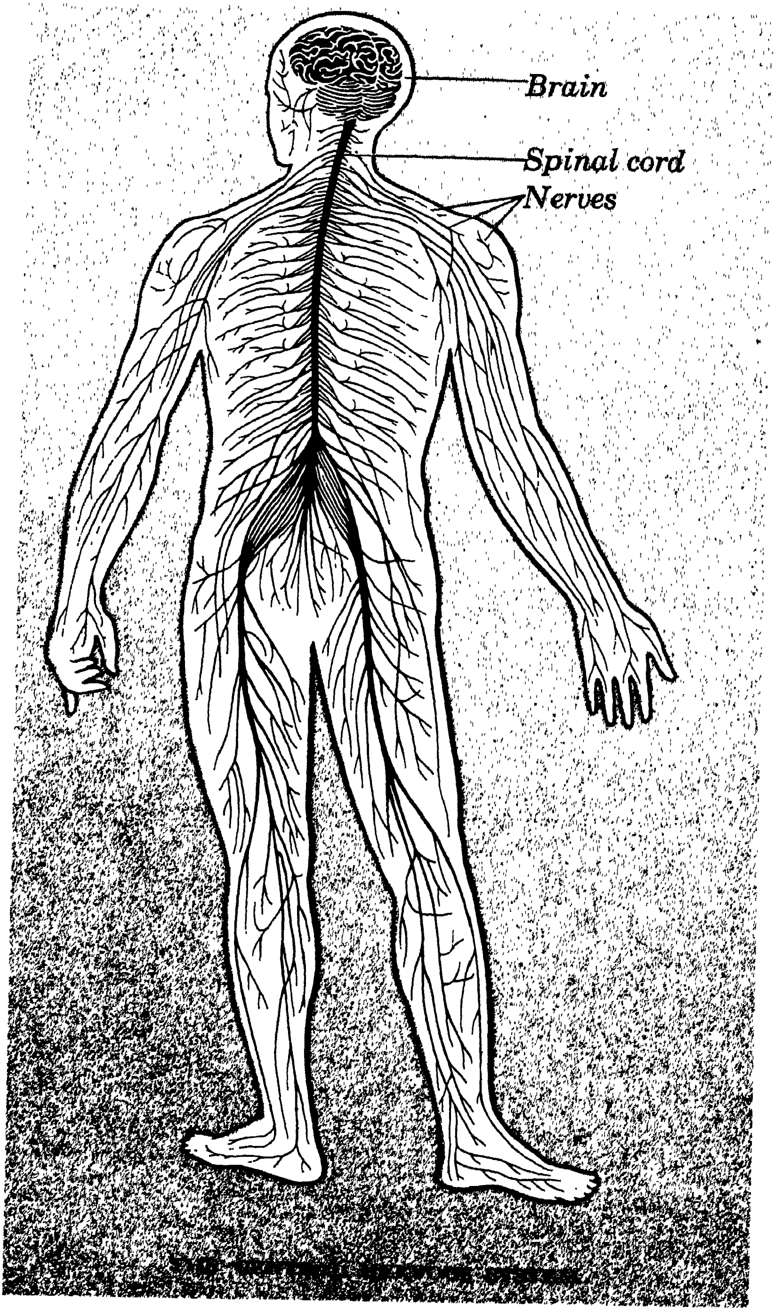
In short, the parasympathetic system works for the welfare of your body. It builds health by helping digestion and the other necessary work of the body and by protecting the organs from strain. The sympathetic system, on the other hand, helps the body to meet emergencies—cold, need for vigorous action, danger. The two systems work against each other. Each one holds the other in check. They take responsibility for the smooth running of our body machine and for meeting body needs as they arise. We do not have to worry about our digestion, our heart beat, or breathing. The autonomic system takes care of these for us.

Do you then have no responsibility? What about getting angry often? What about worrying a great deal about things we can't change? Your emotions are signals to the autonomic system to send more blood to the muscles, to slow up digestion, to use up reserve fuel. Being calm and happy aids the parasympathetic system in its building-up processes. So you see, you *do* have responsibility.

THE CENTRAL NERVOUS SYSTEM

The third system of control is the one you can do most about. This is the central nervous system. The principal parts of the central nervous system are the brain, the spinal cord, and the nerves. The brain, as you know, is in the hard, bony box of the skull. The spinal cord lies safe in a bony tube formed by the backbone, or spine. Nerves connect the brain and spinal cord with all parts of the body. Perhaps you have had a nerve killed in a tooth, and the dentist has shown you a small white thread that he had taken out of the tooth. That was a nerve. The picture on page 290 gives the location of the brain and spinal cord. To show even all the main nerves that branch out from the brain and spinal cord to all parts of the body would make the picture very complicated.

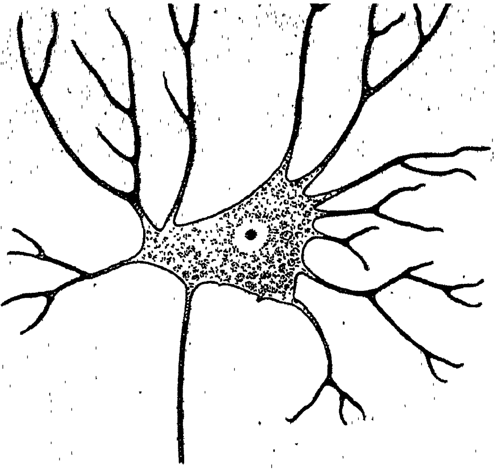
The human brain, spinal cord, and nerves consist of more than 12,000,000,000 nerve cells and their fibers. You will find a picture of one kind of nerve cell on page 292. The nerve cells connect the muscles and eyes, ears, and other sense organs with the brain and spinal


Brain
Spinal cord
Nerves

cord. Some of the nerves that come from the brain and spinal cord divide again and again, as you can see in the diagram on page 290, into smaller and smaller branches until they end in the skin. There they receive messages of pressure, of temperature, and of pain. Before you can feel the book that you hold in your hand, messages must be sent from your fingers along nerves to the brain. These messages are called nerve *impulses.** Before you can raise your hand, a message must be sent along the nerves from your brain to your hand and arm muscles.

The purpose of the nerves is to carry, or conduct, messages, or impulses. For example, if a glaring light is brought into a room, messages are sent from the eye to the spinal cord by the autonomic nervous system. Other impulses are sent to the tiny muscles of the eye that cause the pupil to grow smaller. Or, if you put your finger on a hot stove, at once a message is sent to the spinal cord that the stove is hot. Other impulses are sent back to the muscles of the hand that cause it to draw back. If the nerve is injured at any part of its path, the impulse is blocked. It can go no farther. In time, however, other more roundabout paths may be used, or the nerve fiber may be rebuilt, as was often the case in wounded soldiers in our war hospitals. Within certain limits the nervous system seems to act as a whole.

Your nervous system makes it possible for you to learn. Boys and girls who score high on intelligence tests can learn well from books. But other kinds of learning are important, too—learning to swim and skate, to sit and stand comfortably tall, to hold your book up; learning to get along with other people, learning to work and play wholeheartedly, learning not to be afraid and not to get angry over little things. Perhaps most important of all is learning to face facts as they are rather than as



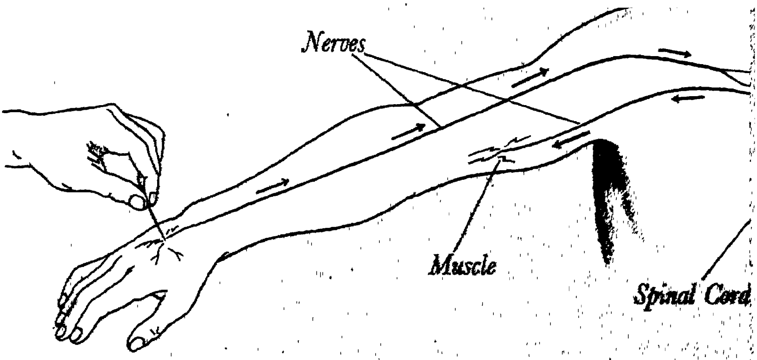
A NERVE CELL

you would like to have them. The ability to do this w help you in many ways.

Physical conditions are tied up with mental. Wh your digestion is out of order or you have some hidd focus of infection, you often feel tired and "blue." T schoolwork of some children has improved after th have had diseased tonsils or adenoids removed. Eyestra toothache, or other persistent pain makes you think a feel differently about the world in general. Feeling s or worried or angry a great deal of the time keeps y from doing your best.

YOUR RESPONSIBILITY FOR YOUR NERVOUS SYSTEM

There are a number of things that determine how w the nerves carry their messages or impulses and a nu ber of ways to keep the nervous system healthy.



THE PATH THAT A MESSAGE MAY TAKE IF THE HAND IS PRICKED

1. *You can eat foods that nourish the nerves.* There is no special brain or nerve food. The kinds of foods that are essential to good nutrition of the body as a whole are also essential to the nutrition of the nervous system. The outside coating of the nerves consists of a fatty material similar to that contained in egg yolk. The body of the nerve cell is rich in phosphorus. A deficiency of vitamin B_1 is one cause of paralysis of the nerves. You see, a diet adequate in every respect is as necessary for the nutrition of the nervous system as for the nutrition of the body as a whole.

But relatively little fuel is needed for mental activity. When you put down a storybook and go outdoors to play ball, the number of calories you need increases greatly. But, when you stop reading the story and begin to do arithmetic problems, the increase in calories needed is so small it can hardly be measured. Therefore, when you are doing an increased amount of mental work, you do not need to eat the larger amount of food that is needed when you are about to do an increased amount of muscular work.

2. *You can have a good supply of oxygen.* A certain amount of oxygen is needed for mental as well as for physical activity. Lack of oxygen in the blood, as in cases of anemia—in which there are too few red blood corpuscles or there is insufficient haemoglobin to carry the normal amount of oxygen—seems to decrease mental alertness. Although little oxygen is actually used by the brain, the oxygen must be supplied by the blood in normal amount.

3. *You can avoid overfatigue.* Overfatigue in time lowers blood pressure. A certain blood pressure is necessary for mental activity. If this pressure fails, the brain is affected. This is what happens when a person faints. Fainting in general is due to a temporary reduction in the amount of blood sent to the brain. When a person has fainted, he is usually placed flat on the floor or bed or with the head low so that the blood will return to the brain more easily.

Parts of the nervous system become tired more easily than the muscles. The nerve impulses have greater difficulty in passing from one nerve cell to another under conditions which produce fatigue. You have probably noticed that you think more slowly when you are tired. If you have been going to bed late for several nights, you seem to have more difficulty in solving arithmetic problems. If you have been on a long walk all day Saturday, you do not feel like studying when you come home at night. You relax.

Three hours of sleep before midnight and a total of at least ten hours of sleep every day help to prevent fatigue. Do you have a quiet bedroom? You rest best in a dark, quiet bedroom. A good deal of the outside noise and light may be shut out by soft, thick window hangings and by similar bed coverings and thick rugs and carpets. Of course such hangings and coverings are very difficult to keep clean, but they may be necessary if the noise is annoying. Walls and ceilings may be built of *soundproof* * material, which absorbs the noise. Go to sleep at about the same hour every night.

The position in which you sleep is not important provided that you stretch out and relax. Some doctors say that relaxation is easiest when you are lying on your back with no pillow. Others advise sleeping on your side with a small pillow under your head.

Ten- or fifteen-minute periods of rest during the day also prevent fatigue and are especially beneficial to anyone who is malnourished or very active all day. Such short periods of relaxation are not a loss of time, because they help one to accomplish more when he goes back to work.

A constant repetition of the same *stimulus** (a stimulus is the thing that starts a nerve impulse traveling along the nerve cells toward the brain or spinal cord) also causes fatigue. It is probably true that the noise of cities is fatiguing to the nervous system even though at the time you pay little attention to it. If a sound is repeated again and again, the nerves stop carrying the impulse to the brain so that you no longer notice the sound. Yet the long continuance of din or a noisy sound, even after one has ceased to notice it, may result in a fatigue of the nerves that makes one feel irritable or, as he sometimes says, "ready to fly."

If there is a bad odor in a room, after a time the nerves stop carrying the impulse to the brain and you no longer notice the odor. You have probably had someone come into a room in which you were sitting and tell you how close and stuffy it was. Your nerves had been stimulated so often by the odor that they stopped conducting the impulse. Much the same thing happens when a muscle that has been used again and again can no longer keep on acting and you say that you "are too tired to lift your hand."

You should always pay attention at once to unusual sights and sounds and odors. Many of these sensations warn you of danger. The sound of an automobile horn, the odor of escaping gas, and other sensations are as important signals to be heeded as the red and green lights on the railroad. You should also pay attention to the sensations from fatigued muscles and rest, if possible, when you begin to feel tired.

Intense or prolonged emotion is perhaps the most fatiguing of all stimulations. Have you ever attended a very exciting football or baseball game and felt almost as tired afterward as if you had been one of the players? Or have you felt tired when you were discouraged?

4. *You can drink milk and fruit juices instead of drinks that contain caffeine.** Tea and coffee, as you know, contain caffeine. So do a number of the *carbonated* * drinks on the market. The caffeine for most of these carbonated drinks comes from the kola nut. The following drinks contain these amounts of caffeine:

1 cup of coffee	0.15 gram of caffeine
1 cup of tea	0.10 gram of caffeine
1 12-ounce bottle of a kola drink	0.10 gram of caffeine

Caffeine in these amounts—0.10 to 0.15 gram—causes mild stimulation; ten to seven times as much—1.0 gram—causes intense excitement and sometimes serious disturbance of the nervous system; 2.5 grams or more may depress instead of stimulate; and 10 grams may cause death.

In the amounts tea, coffee, and cola drinks are usually taken, they keep many people from going to sleep promptly. They may take away for a time the feeling of fatigue. They are especially harmful when they make a person delay taking needed rest, when they crowd out real food, and when they make the heart work harder.

5. *You can avoid alcoholic beverages.* The immediate effect of alcohol upon the nervous system differs greatly with different people. A small dose usually causes a feeling of well-being and joviality. If further doses are taken, the person tends to become excited, talkative, and noisy, or silly and sentimental, or to have sudden outbursts of temper. Continued dosing results in stammering, inability to walk straight, and finally drugged sleep, often interrupted by attacks of severe nausea and vomiting. Even in the first stages of intoxication the ability to drive a car or carry on any activities involving finer degrees of muscular *coordination,** good judgment, or caution is decreased. In the second stage of intoxication self-control is partially lost and the will power is weakened. After the second stage the individual is hardly responsible for his words and acts.

One experimenter in measuring intellectual work found that, even with moderate doses of alcohol, a person will make more errors than usual in adding a column of figures and will be slower in recognizing letters and words. It is often twelve to twenty-four hours after even a moderate dose of alcohol before a person can add and think as well as usual. Other recent experiments have shown that alcohol caused cats to forget tricks they had learned.

ALCOHOLIC BEVERAGES NEVER HELPED TO WIN A WORLD SERIES.

Continued overuse of strong drinks, like whiskey and gin has sometimes resulted in inflammation of the nerve trunks (neuritis) and attacks of wild behavior (delirium tremens). If drinking continues, these conditions are followed by loss of memory, loss of self-control, and finally even *insanity* * and paralysis. One very definite effect of alcohol on many persons is that it creates a demand for more alcohol. The habit-forming tendency of alcohol is one of its outstanding dangers.

6. *You can avoid nicotine in tobacco.* Nicotine, by its action upon the adrenal glands and the nerves, causes the heart to beat faster. Contrary to general opinion, smoking does not usually stimulate thought. It apparently somewhat stimulates *routine* thinking, such as adding figures, but in the majority of cases it definitely slows up the *learning process.* Although the first effect of tobacco is sometimes a soothing one, the later effect is often to increase the irritability of the nervous system and to make the person restless until he can smoke again. One

scientist has said, "Probably most smokers acquire a somewhat irritable nervous system."

Many studies have shown that boys who do not smoke do better schoolwork than the boys who smoke. The following table illustrates this fact.

GRADES OF SMOKERS AND NONSMOKERS [1]

	Average Grade
77 who had never smoked	84.5
24 who had quit smoking	80.5
55 habitual smokers, enrolled in school	76.0
45 habitual smokers, not enrolled in school	69.0
Nonsmokers (ten highest)	90.0
Smokers (ten highest)	78.9

The teachers who have made the observations for these studies say that tobacco may not be the cause of low scholarship. It is probable that pupils who smoke are also those who are not interested in doing exceptionally good academic work. The boy who smokes often goes with a group of boys who spend a good deal of time standing on street corners. The boy who does not smoke is more likely to belong to an athletic team or outdoor club that has regular meetings and to devote himself to study in the late afternoon and in the evening.

7. *Under no circumstances take any of the habit-forming drugs. Opium,* morphine,* heroin,** and *cocaine* * are drugs that are sometimes taken by people who are discouraged and have a keen sense of failure. Some of the victims of drugs began to take them in order to relieve pain. The habit became established before they realized

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[1] Walter L. Mendenhall, *Tobacco*, page 41; Harvard University Press.

that it was being formed. Many times the drug habit is formed for some social reason. The person first takes the drug because others in his group are using it. Bad companions also make it difficult for one who starts taking a drug to free himself from its use. He tends constantly to increase the dose. After the habit is established, the aftereffects when one cannot get the drug—anxiety, *depression,** weakness, nausea, and pain in the abdomen—are so severe that the victim will commit almost any crime to get relief. He often lies and steals. He will spend money for the drug even if he or his family must go without food. The people who sell the drugs take advantage of his intense desire. They may raise the price of the drug, or they may refuse to sell it until the person is willing to commit some crime to get money for it.

In the last few years another dangerous drug has been sold in the United States. There are many slang names for it, but its scientific name is *marijuana.** The most common way of taking it is in cigarettes. Marijuana cigarettes are sometimes sold near schools. A few boys and girls think it is clever to smoke them. They are running a foolish risk. Scientists are studying the ways in which marijuana affects the mind and the body. People who use marijuana often lose their self-control and do things they would never do ordinarily.

Much harm may be done by "cure-all" medicines. Some people are especially sensitive to certain drugs. Such drugs may be included in headache or cough medicines under other names. People can protect themselves only by avoiding all medicines except those whose content is clearly stated. Many patent medicines contain alcohol. Often there is a large amount of alcohol in each bottle. This alcohol has the same effects as alcohol in beverages.

1. Betty had set her heart on a new dress for the graduation party. Her father and mother said they could not afford to buy one. Betty cried and felt very angry at her parents. She told them, "You find money for other things. You could buy the dress if you cared enough about it." To be sure, the dress was important to Betty, but how could she have handled the situation in a more grown-up, less emotional way? Could she have said:

"Mother, do you have an old dress we could make a silk skirt from? I have a pretty blouse I could wear with it."

"Mrs. Keene will pay me for taking care of her children when she goes out. Perhaps I can earn enough money for a dress that way. I'm good at baby sitting."

"Maybe no one will notice my dress much if my hair is pretty and I'm full of fun."

"Mary and Alice, I know, will not have new dresses. They might feel worse about it if I had one."

"Clothes are not everything. It takes a smart girl to be popular in an old dress."

2. Fred's parents were always criticizing him. Which of these would be the best ways for him to handle this situation?

a. Go off by himself and brood over it.

b. Feel more and more hopeless about himself.

c. Think, "I guess I'll never amount to anything."

d. Say to his parents, angrily, "Why do you always pick on me?"

e. Take the criticism good-naturedly whether he agrees with it or not.

g. Think, "I'll be careful how I criticize other people. I know how it feels to be criticized. If I have to criticize, I'll give some praise first."

3. Ted and Sam had been pals. Now Ted often did things with other boys. What should Sam do about it?

TRUE OR FALSE?

By placing plus or minus signs opposite the numbers 1 to 12 written on the left side of your paper, show which of these statements are correct and which are incorrect. How high is your score?

1. Intelligence is necessary for learning other things besides school lessons.
2. Nerves connect the different organs of the body and enable it to work as a whole.
3. The sympathetic nervous system makes the body prepare for danger or emergencies.
4. Your physical condition has no effect on the way your mind works.
5. A well-balanced diet is necessary to give the nerve cells the food substances they need.
6. Studying uses up as many calories as playing ball.
7. Lowered blood pressure affects the brain.
8. Sleep and rest are necessary to keep the nervous system healthy.
9. When you stop noticing noise, it no longer fatigues your nerves.
10. Emotional excitement is less tiring than physical exercise.
11. Smoking hastens the learning process.
12. Headache cures may contain dangerous drugs.

INTERESTING BOOKS

AHRENS, BUSH, and EASLEY—*Living Chemistry,* pp. 176-183

ENGLISH—*Your Behavior Problems*

HARKNESS and FORT—*Youth Studies Alcohol*

JENKINS and NEUMAN—*How to Live with Parents*

NEUGARTEN—*Your Heredity*

RICE and HARGER—*Effects of Alcoholic Drinks, Tobacco, Sedatives, Narcotics*

YOU AND YOUR FUTURE

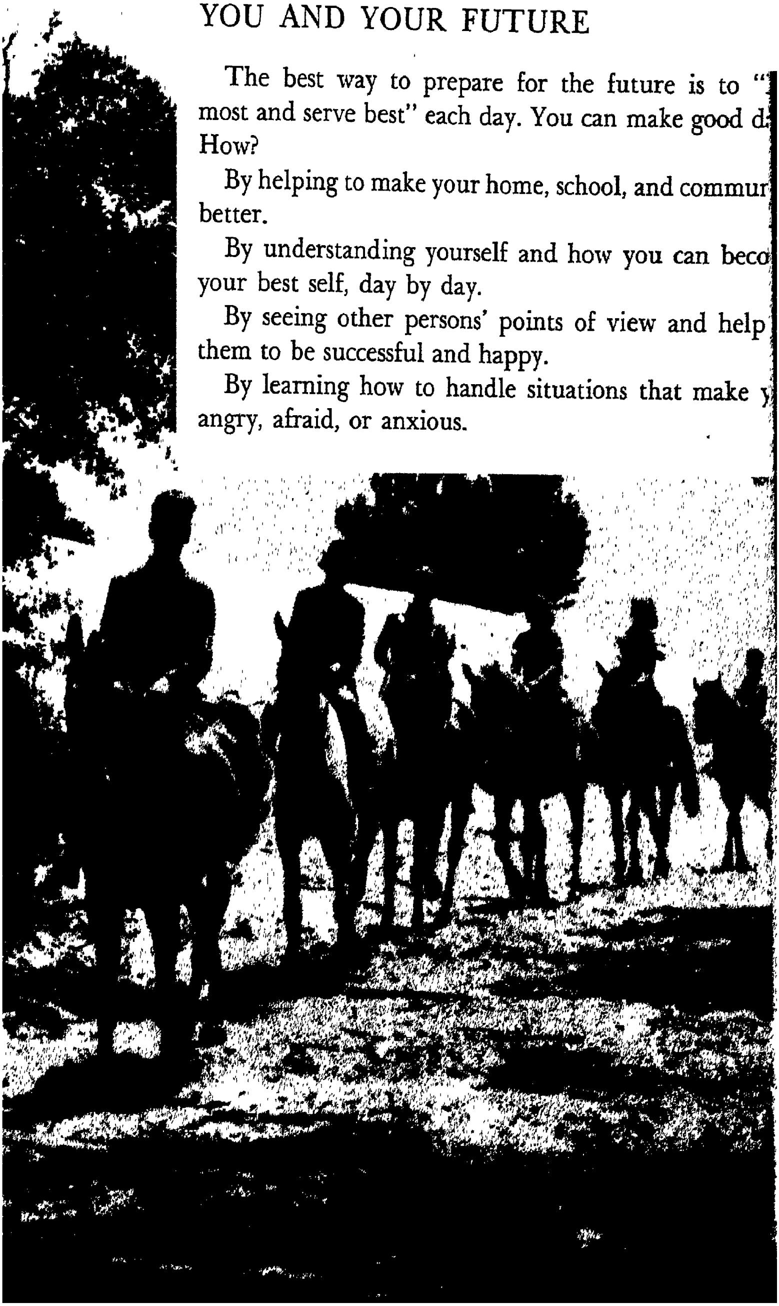
The best way to prepare for the future is to “
most and serve best” each day. You can make good d
How?

By helping to make your home, school, and commun
better.

By understanding yourself and how you can beco
your best self, day by day.

By seeing other persons’ points of view and help
them to be successful and happy.

By learning how to handle situations that make y
angry, afraid, or anxious.



PROGRESS THROUGH PERSONAL GROWTH

"I'll do the dishes even though Mom didn't ask me to."

"I made that mistake, Mr. Jones, and I'll correct it."

"I haven't been much good on this new job; I'll talk with the counselor about it."

These are ways of showing that you are growing up. You take responsibility. You enjoy leisure, too, filled with worth-while hobbies and adventures. In every city and village there should be playgrounds and buildings where persons of all ages can study and experiment, play, listen to stories, give plays, and do other creative work.

The youth organizations—Scouts, Camp Fire Girls, Future Farmers of America, and 4-H Clubs—have done a great deal to help people use their leisure time wisely. These clubs, guided by trained men and women, give young people a chance to take part in a wide variety of activities, including the raising of food, the beautifying of homes and grounds, the learning of arts and crafts, and assistance with community work. In a world full of important needs no American young person should feel useless or be without a place to go for hobbies, crafts, sports, and other satisfying leisure activities.

In many places the school building is kept open afternoons and evenings and during vacations for leisure-time activities. In every place there are young people who want to learn to do many things and other persons who have much to teach. They should be able to get together. Are the schools in your community used for leisure-time and community activities? If not, perhaps you can be one of the pioneers in a new area of better living in your community. Other young people have done this.

How big is the world you live in? Does it take in new experiences, new friends, and new places? The world is full of interesting things to learn, things to see, things to do. Find them in your community. Find the kind of useful work that needs to be done and that is suitable for you. Get the education you need to do it.

PROGRESS THROUGH SERVICE

In some schools the students have found so many health activities to engage in that they have organized student health clubs. By working together they have found that they can accomplish much more and have a better time doing it than they could individually.

The purpose of a student health club would be to raise the standards of health in the school and in the community and to interest people in living more healthfully. That sounds just a bit stuffy and trite, but let's see what activities a student health club might sponsor. When you are considering these activities, try to read between the lines to see how much fun and interest they would provide. The following are merely suggestions. You will undoubtedly think of many more.

1. Learn how to be a good baby sitter.

2. Check to make sure that every classroom has thermometers. Appoint club members to read the thermometers three times a day to be sure that the room temperature is about 68° F.

3. Find out whether or not each classroom is well lighted. (A man from the electric light company would undoubtedly be glad to give you many valuable pointers about room lighting.)

4. The club could co-operate with the school doctor in arranging a schedule and seeing to it that students

kept their appointments during any testing programs for tuberculosis or other diseases.

5. Work out a health inventory which could be used as information for the nurse or school doctor just before a physical examination of the students. It would tell what diseases you have had, what physical defects had been corrected, and any health problems you have.

6. Invite a speaker to discuss mental health.

7. Sponsor health assemblies; make them dramatic.

8. If mosquitoes are a problem in your community, work with the local mosquito extermination group. Find out what students can do to help rid the community of mosquitoes. Inform all students and urge them to join in combating the pests.

9. Outline a "Keep Your Town Clean" campaign and take the lead in getting people interested in cleaning up their yards and front walks.

10. Find out what the regulations are on public drinking fountains. Check to see if the ones at your school come up to standard. You might also check community drinking fountains. Do something about remedying any faulty ones.

11. Raise money to provide glasses or dental care for needy students who are not otherwise taken care of.

These suggestions may give you still other ideas which you could work out in your own school and community. Boys and girls, old and young, will work together. It gives you a good feeling inside to think that you are bettering conditions around you and doing something worth while.

Problems to Solve

1. Which suggestions for healthful living are mentioned again and again in this book? Which seem most important to you? Which do you still need to work on?

2. Jack was thinking of the future. Was there any future for him but military service? Which of these ways would be the best for him to feel about it?

a. "The army will get me—so what's the use of doing good work in school?"

b. "There's no use starting senior high school. I'd rather go to work now, earn some money, and have a good time."

c. "My chances of advancement will be better if I do well in high school."

d. "If I graduate from high school, I can go to college when I get out of the service."

e. "I'll try to understand what is going on in the world and do my share to make it better."

3. What can you do to make your community a healthier, happier place to live?

4. Do you have fun? No time? You do have time. Don't waste it. Plan to spend it well:

At noon take a walk with friends or play quiet games out of doors.

After school, do your chores first if possible; then play your favorite game, take a hike, gain skill in sports, make things, too, in arts and crafts.

Enjoy music—make it yourself sometimes.

Enjoy plays—give them yourself sometimes.

5. How can you keep learning about healthful living? Read reliable books, magazines, and newspapers; listen and look at the best TV and radio programs; visit health services in your community.

INTERESTING BOOKS

BILLETT and YEO—*Growing Up*
EVANS—*Let's Plant Grass*
GEISEL—*Personal Problems*
HUNT—*High School Ahead*
STRANG—*Investing in Yourself*
ULLMANN—*Getting Along with Brothers and Sisters*

REFERENCES

AHRENS, MAURICE R., BUSH, NORRIS F., and EASLEY, RAY K.—Living Chemistry; Ginn and Company, 1942.

AMERICAN DENTAL ASSOCIATION— *Teeth, Health, and Appearance;* American Dental Association, 1940.

AMERICAN RED CROSS—*American Red Cross First Aid Textbook* (Latest Ed.); The Blakiston Company, 1945.

—— *Red Cross Home Nursing* (School Edition); The Blakiston Company, 1943.

BAER, MARIAN E.—*Pandora's Box;* Farrar and Rinehart, 1939.

BENNET, HUGH H., and PRYOR, WILLIAM C.—*This Land We Defend;* Longmans, Green and Company, 1942.

BILLETT, ROY O., and YEO, J. WENDELL—*Growing Up;* D. C. Heath and Company, 1951.

BRANDWEIN, PAUL F., and OTHERS—*You and Your World;* Harcourt, Brace and Company, 1953.

BROCKMAN, MARY—*What Is She Like?* Charles Scribner's Sons, 1936.

CARROLL, FRANKLIN—*Understanding Our Environment (Interpreting Science,* Book I); The John C. Winston Company, 1939.

DOLCE, JAMES A.—*Until the Doctor Comes;* U. S. Government Printing Office, 1941.

DRENCKHAHN, VIVIAN V., and TAYLOR, C. R.—*Your Child's Teeth;* American Dental Association, 1940.

DUFFUS, R. L.—*The Valley and Its People;* Alfred A. Knopf, 1944.

ELLIOT, CHARLES N.—*Conservation of American Resources;* Turner E. Smith, 1951.

ENGLISH, O. SPURGEON—*Your Behavior Problems;* Science Research Associates, 1952.

Evans, Eva Knox—*Let's Plant Grass;* West Georgia College, Publications Committee, 1944.

Evans, William A.—*Everyday Safety;* Lyons and Carnahan, 1952.

Fitzpatrick, Frederick L., and Bain, Thomas D.—*Living Things;* Henry Holt and Company, 1953.

Fowler, George W.; Collister, Merton C.; and Thurston, Ernest L.—*Science and You;* Iroquois Publishing Company, 1952.

Geisel, John B.—*Personal Problems;* Houghton Mifflin Company, 1949.

Giles, Nell—*Susan Tells Stephen;* Cushman and Flint, 1942.

Hark, Mildred, and McQueen, Noel—*Make Your Pennies Count;* Science Research Associates, 1953.

Harkness, Kenneth, and Fort, Lyman—*Youth Studies Alcohol;* Benjamin H. Sanborn and Company, 1936.

Henry, William E.—*Exploring Your Personality;* Science Research Associates, 1952.

Hunt, Rolfe Lanier—*High School Ahead;* Science Research Associates, 1952.

Jenkins, Gladys Gardner, and Neuman, Joy—*How to Live with Parents;* Science Research Associates, 1950.

Kuder, G. Frederic, and Paulson, Blanche B.—*Discovering Your Real Interests;* Science Research Associates, 1949.

Lasser, J. K., and Porter, Sylvia F.—*Money and You;* Science Research Associates, 1949.

McCoy, L. L.—*Whom Shall I Consult—Optician, Optometrist, Oculist, Ophthalmologist or Ophthalmic Physician?* American Medical Association.

McDermott, Irene E., and Nicholas, Florence W.—*Homemaking for Teenagers,* Charles A. Bennett Company, 1951.

Meister, Morris; Keirstead, Ralph; and Shoemaker, Lois M.—*The Wonder World of Science,* Book VII; Charles Scribner's Sons, 1950.

MENNINGER, WILLIAM C.—*Enjoying Leisure Time;* Science Research Associates, 1950.

—— *Making and Keeping Friends;* Science Research Associates, 1952.

—— *Understanding Yourself;* Science Research Associates, 1948.

MORTON, DUDLEY JOY—*Oh, Doctor! My Feet!* D. Appleton-Century Company, 1939.

NATIONAL ASSOCIATION OF SECONDARY SCHOOL PRINCIPALS—*Consumer Education Study Series* of small books on advertising, consumer problems, and investing in yourself; National Association of Secondary School Principals, 1945-1947.

NEUGARTEN, BERNICE L.—*How You Grow;* Science Research Associates, 1951.

NORLIN, ELINOR E., and DONALDSON, BESSIE M.—*Everyday Nursing for the Everyday Home;* The Macmillan Company, 1942.

OBOURN, ELLSWORTH; HEISS, ELWOOD D.; and MONTGOMERY, GAYLORD C.—*Science in Everyday Life;* D. Van Nostrand Company, 1953.

OLESEN, ROBERT—*Common Colds;* U. S. Government Printing Office, 1940.

PARKER, BERTHA MORRIS, and DOWNING, M. ELIZABETH—*Community Health;* Row, Peterson and Company, 1949.

PARKER, BERTHA MORRIS, and FRYE, HORACE R.—*Water Supply and Sewage Disposal;* Row, Peterson and Company, 1946.

PHILADELPHIA CHILD HEALTH SOCIETY—*Food Value Charts;* Room 609, 311 S. Juniper St., Philadelphia, 1942.

PIERCE, WELLINGTON G.—*This Is the Life;* D. C. Heath and Company, 1951.

RAY, ERMIN L., and WASHBURN, STANLEY, JR.—*Are You Fit to Be a Pilot!* Wilfred Funk, Inc., 1941.

REED, W. MAXWELL—*America's Treasure;* Harcourt, Brace and Company, 1939.

RHYNE, CONWAY L., and LORY, ELLSWORTH E.—*Conservation of Natural Resources;* Ginn and Company, 1944.

RICE, THURMAN B., and HARGER, ROLLA N.—*Effects of Alcoholic Drinks, Tobacco, Sedatives, Narcotics;* Wheeler Publishing Company, 1949.

RIEDMAN, SARAH R.—*Your Blood and You;* Henry Schuman, 1952.

SHACTER, HELEN—*Getting Along with Others;* Science Research Associates, 1949.

STRANG, RUTH—*Investing in Yourself,* Consumer Education Study; National Association of Secondary-School Principals, 1945.

ULLMANN, FRANCES—*Getting Along with Brothers and Sisters;* Science Research Associates, 1950.

U. S. DEPARTMENT OF AGRICULTURE—*Farm Work and Safety for Young People;* U. S. Government Printing Office, 1943.

U. S. DEPARTMENT OF AGRICULTURE, BUREAU OF HOME ECONOMICS—*Fight Food Waste in the Home,* series of ten charts; U. S. Government Printing Office, 1942.

WATKINS, RALPH K., and PERRY, WINIFRED—*Understanding Science (Science in Our Modern World,* Book 1); The Macmillan Company, 1940.

—— *Science for Daily Use (Science in Our Modern World,* Book II); The Macmillan Company, 1940.

WILLIAMS, JESSE F., and OBERTEUFFER, DELBERT—*Health in the World of Work;* McGraw-Hill Book Company, 1942.

WINGATE, ISABEL; GILLESPIE, KAREN R.; and ADDISON, BETTY G.—*Know Your Merchandise;* Harper and Brothers, 1944.

WOODWARD, ELIZABETH—*Personality Preferred!* Harper and Brothers, 1935.

GLOSSARY

This glossary explains the less common words in this book. It includes each word in the text that has a star (*) after it. The page reference indicates the first use of the word.

Key to Sounds

ā *as in* āte
ā̇ *as in* car′bon-ā̇te
â *as in* câre
ă *as in* ăm
ă *as in* fi′n*ă*l
ä *as in* ärm
ȧ *as in* ȧsk
ȧ *as in* so′f*ȧ*
ē *as in* ēve
ē̇ *as in* ē̇-vent′
ĕ *as in* ĕnd

ĕ *as in* move′m*ĕ*nt
ẽ *as in* moth′ẽr
ī *as in* īce
ĭ *as in* ĭll
ō *as in* ōld
ō̇ *as in* ō̇-bey′
ô *as in* ôr′der
ŏ *as in* ŏdd
ŏ̇ *as in* lŏ̇ss
ŏ *as in* c*ŏ*r-rect′
oi *as in* oil

o͞o *as in* fo͞od
o͝o *as in* fo͝ot
ou *as in* out
ū *as in* ūse
ū̇ *as in* ū̇-nite′
û *as in* bûrn
ŭ *as in* ŭp
ŭ *as in* cir′c*ŭ*s
t̶h̶ *as in* bat̶h̶e
zh *like the* s *in* treas′ure

ABDOMEN (ăb-dō′mĕn). The front part of the trunk of the body, just below the chest. (p. 38)

ABSCESS (ăb′sĕs). A collection of pus in any part of the body. (p. 59)

ABSCESSED (ăb′sĕst). Having an abscess, or collection of pus. (p. 53)

ABSORB (*ă*b-sôrb′). To swallow up; to soak up. (p. 30)

ABSORBENT (*ă*b-sôr′b*ĕ*nt). Having the power to absorb, or soak up. (p. 242).

ABSORPTION (*ă*b-sôrp′sh*ŭ*n). The process of swallowing up or of soaking up. (p. 41)

ACIDOPHILUS (ăs′ĭ-dŏf′ĭ-l*ŭ*s). Referring to a kind of bacterium which can live in very acid surroundings. (p. 65)

ACIDOSIS (ăs′ĭ-dō′sĭs). An excess of acid in the body cells and fluids. (p. 36)

ACNE (ăk′nē̇). A breaking out of the skin, chiefly of the face, commonly called *pimples*. (p. 227)

ADENOID (ăd′ē̇-noid). A group of cells forming a spongy growth or swelling that partly blocks the passage between the nose and the throat. Also called *adenoid tissue*. (p. 56)

ADOLESCENCE (ăd′ō̇-lĕs′ĕns). The growing from childhood to maturity; youth. (p. 229)

ADRENAL GLANDS (ăd-rē′năl). Two small organs which lie just above the kidneys. These glands secrete adrenin into the blood stream. (p. 89)

ADRENIN (ăd-rĕn′ĭn). The natural secretion of the adrenal glands. (p. 8)

ALCOHOL (ăl′kō̆-hŏl). A colorless liquid which is the part of beer, wine, and whisky that intoxicates. (p. 8)

ALCOHOLIC (ăl′kō̆-hŏl′ĭk). Of or pertaining to alcohol. (p. 8)

ALIMENTARY CANAL (ăl′ĭ-mĕn′tȧ-rĭ). The continuous tube in which digestion takes place, including the mouth, gullet, stomach, and intestines. (p. 24)

ALKALINE (ăl′kȧ-līn). Of or relating to an alkali. In a sense *alkaline* is the opposite of *acid*. (p. 67)

ALLERGIC (ă-lûr′jĭk). Sensitive or susceptible to certain substances such as the pollen of weeds. (p. 252)

ANATOMY (ȧ-năt′ō̆-mĭ). The science of the structure of animals or plants. (p. 15)

ANEMIA (ȧ-nē′mĭ-ȧ). A deficiency of haemoglobin or of red cells in the blood. (p. 82)

ANEMIC (ȧ-nē′mĭk). Suffering from anemia. (p. 82)

ANESTHETIC (ăn′ĕs-thĕt′ĭk). A substance used to keep a person from feeling pain. Some anesthetics put a person to sleep, as during a surgical operation. Other anesthetics deaden the feeling in only a part of the body, such as the anesthetic a dentist may inject near a tooth. (p. 259)

ANTIBIOTIC (ăn′tī-bī-ŏt′ĭk). A drug that is used to treat infections when sulfa drugs fail. (p. 267)

ANTIDOTE (ăn′tĭ-dōt). A substance given to neutralize a poison that has been swallowed. (p. 216)

ANTIHISTAMINES (ăn′tī-hĭs′tȧ-mĭnz). New medicines, of help in treating certain illnesses. (p. 113)

ANTIDOTE (ăn′tĭ-dōt). A substance given to neutralize a poison that has been swallowed. (p. 216)

ANTISEPTIC (ăn′tĭ-sĕp′tĭk). Referring to a substance that stops the growth of microorganisms without necessarily killing them. (p. 117)

ANTITOXIN (ăn′tĭ-tŏk′sĭn). A chemical substance made by the human or animal body which can render the poisons of certain bacteria harmless. (p. 261)

APPENDICITIS (ă-pĕn′dĭ-sī′tĭs). Inflammation of the appendix. (p. 39)

APPENDIX (ă-pĕn′dĭks). A small, narrow tube at the beginning of the large intestine, on the lower right side of the abdomen. (p. 39)

AROMATIC SPIRITS OF AMMONIA (ăr′ō̆-măt′ĭk, ă-mō′nĭ-ȧ). A medicine used to treat fainting. (p. 209)

ARTERIAL SCLEROSIS (är-tē'rĭ-ăl sklē-rō'sĭs). Hardening of the arteries. (p. 90)

ARTERY (är'tēr-ĭ). A blood vessel leading away from the heart. (p. 71)

ARTHRITIS (är-thrī'tĭs). Inflammation of the joints. (p. 269)

ARTIFICIAL RESPIRATION (är'tĭ-fĭsh'ăl rĕs'pĭ-rā'shŭn). A method of restoring breathing by pressing and releasing the lower ribs. (p. 204)

ASCORBIC ACID (ăs-kôr'bĭk ăs'ĭd). The chemical name for vitamin C. (p. 46)

ASTIGMATISM (ȧ-stĭg'mȧ-tĭz'm). A defect of the eye in which rays from a point are not brought to a single focal point on the retina. (p. 126)

ATABRINE (ăt'ȧ-brĭn). A drug used in preventing and curing malaria. (p. 268)

ATHLETE'S FOOT (ăth'lēts). A kind of fungous infection, usually found on the feet. (p. 193)

AUREOMYCIN (aw'rĭō-mī'sĭn). A new drug that is valuable in treating illnesses of the respiratory tract. (p. 268)

AURICLE (ô'rĭ-k'l). One of the upper cavities of the heart. (p. 73)

AUTONOMIC NERVOUS SYSTEM (ô'tō-nŏm'ĭk). The branch of our nervous system that acts without our will. (p. 9)

BACILLUS (bȧ-sĭl'ŭs). Any rod-shaped bacterium. The plural is *bacilli*. (p. 65)

BACTERIA (băk-tēr'ĭ-ȧ). Microscopic living things belonging to the plant kingdom. The singular is *bacterium*. (p. 5)

BCG VACCINE (văk'sēn). A vaccine used to protect persons against tuberculosis. It has been tested and found to be effective in preventing tuberculosis; it will not cure tuberculosis. (p. 274)

BENZOATE OF SODA (bĕn'zō-āt). A drug combining benzoin and soda. It is sometimes used to keep food from spoiling. (p. 37)

BICEPS (bī'sĕps). A muscle having two heads; the large muscle of the front of the upper arm. (p. 160)

BILE. The yellow or greenish fluid secreted by the liver; gall. (p. 25)

BILIOUSNESS (bĭl'yŭs-nĕs). A name commonly given to a variety of symptoms, such as nausea, headache, and pain in the intestines. Really disorder due to interference with proper flow of bile. (p. 30)

BLACKHEAD. Enlarged pore filled with dirt and oil. (p. 232)

BLOOD BANK. Supplies of blood kept for transfusions. (p. 79)

BLOOD PRESSURE. The force of the blood pressing against the walls of the blood vessels. (p. 89)

BLOOD TRANSFUSION (trăns-fū′zh*ŭ*n). Transferring blood from one person's blood vessels to another person's blood vessels. (p. 79)

BORIC ACID. A disinfectant for washing wounds; also used as an eyewash. (p. 122)

BRONCHIAL TUBES (brŏng′kĭ-*ă*l). The two subdivisions, also called *bronchi*, of the windpipe, one going to each lung. (p. 97)

BRONCHITIS (brŏn-kī′tĭs). Inflammation of the mucous membrane of the bronchial tubes, or bronchi. (p. 100)

BUBONIC PLAGUE (bū̆-bŏn′ĭk plāg). An acute communicable disease spread from rats to man by the bite of the rat flea. (p. 261)

CAFETERIA (kăf′ė-tē′rĭ-*ȧ*). An eating place where one serves himself. (p. 48)

CAFFEINE (kăf′ė-ĭn). A drug found in coffee, tea, and some other drinks. (p. 296)

CALCIUM (kăl′sĭ-*ŭ*m). A soft, white metallic element found only in combination with other elements, as with oxygen. (p. 46)

CALORIE (kăl′ȯ-rĭ). A unit measure of the heat energy in food. (p. 46)

CAMPHOR (kăm′fẽr). A white, gumlike substance with a noticeable odor. It may be combined with other substances. (p. 114)

CANCER (kăn′sẽr). A disease in which certain tissue cells grow in a wild and harmful way. (p. 269)

CAPILLARY (kăp′ĭ-lĕr′ĭ). One of the small, hairlike blood vessels joining the arteries and veins. (p. 5)

CARBOHYDRATE (kär′bȯ-hī′drāt). One of a class of carbon compounds, or substances, found in protoplasm, starches, and sugars. (p. 30)

CARBON (kär′bŏn). An element found pure, as in the diamond, but also in many compounds. (p. 147)

CARBONATED (kär′bŏn-āt′ĕd). Charged or filled with carbonic acid or carbon dioxide gas. Soft drinks like soda water are carbonated beverages. (p. 296)

CARBON DIOXIDE (dī-ŏk′sīd). A heavy gas given off from the lungs of animals or from decaying matter. It furnishes food for plants. (p. 76)

CARBON MONOXIDE (mŏn-ŏk′sīd). A colorless, very poisonous, odorless gas. (p. 109)

CARIES (kā′rĭ-ēz). Decay, especially of bones or teeth. (p. 58)

CATHARTIC (kȧ-thär′tĭk). A medicine which is used to clean or move the bowels. (p. 39)

CELL. One of the tiny living parts of which the body is built. (p. 3)

CEMENT (sē-mĕnt′). A hard substance covering the root of the tooth and protecting the softer dentine underneath. (p. 55)

CENTRAL NERVOUS SYSTEM. The brain, spinal cord, and nerves. (p. 277)

CHEMICAL (kĕm′ĭ-kăl). Relating to chemistry, the science of the composition of substances and of their changes. A substance obtained by the use of chemistry. (p. 37)

CHLOROMYCETIN (klô′rō-mī′sĕt-ĭn). A new drug that is valuable in treating illnesses of the respiratory tract. (p. 268)

CHOLERA (kŏl′ĕr-ȧ). A bacterial disease common in Asia, which comes on quickly and often causes death. (p. 268)

CHRONIC (krŏn′ĭk). Lasting a long time. (p. 111)

CILIARY MUSCLE (sĭl′ĭ-ĕr′ĭ). A small muscle within the eyeball for changing the shape of the lens so that we may see objects at different distances. (p. 124)

CIRCULATORY SYSTEM (sûr′kū-lȧ-tō′rĭ). The heart, arteries, capillaries, and veins, working together. (p. 69)

CLINIC (klĭn′ĭk). A specially prepared place where people are given treatment for various ailments. (p. 65)

CLINICAL (klĭn′ĭ-kăl). Relating to a clinic or to a sickbed. A clinical thermometer is a small glass thermometer used for taking a patient's temperature. (p. 4)

CLOT. To change from a fluid to a jelly, as in the blood. (p. 76)

COCAINE (kō-kān′). A bitter, habit-forming drug obtained from coca leaves. (p. 299)

COLLISION (kŏ-lĭzh′ŭn). Crash; the act of coming together or hitting together with force. (p. 176)

COLON (kō′lŏn). The large intestine. (p. 40)

COMMUNICABLE (kŏ-mū′nĭ-kȧ-b'l). Capable of being passed from one person to another. (p. 111)

COMPLEXION (kŏm-plĕk′shŭn). Color of the skin, especially of the face. (p. 24)

COMPOSITION. The parts or elements of a substance. (p. 80)

COMPRESS (kŏm′prĕs). Folds of wet or dry cloth used in caring for injuries. (p. 201)

CONSERVATION (kŏn′sĕr-vā′shŭn). Saving, or storing, and building a supply for future use. (p. 125)

CONSTIPATION (kŏn′stĭ-pā′shŭn). A disturbance of the bowels, or intestines. Waste material is difficult to eliminate and collects in the intestine. (p. 38)

CONSUMER (kŏn-sūm′ẽr). One who uses things. (p. 245)

CONSUMPTION (kŏn-sŭmp′shŭn). Using things. (p. 247)

CONTRACT (kŏn-trăkt′). To shorten or draw together. (p. 28)

CONTRACTION (kŏn-trăk′shŭn). A shortening or drawing together. (p. 32)

CONVEX (kŏn′vĕks). Curved out; bulging; opposite to *concave*. (p. 124)

COORDINATION (kō̇-ôr′dĭ-nā′shŭn). A working together or in harmony. (p. 297)

CORNEA (kôr′nē̇-ȧ). The transparent window forming the front of the outer coat of the eye. (p. 123)

CORPUSCLE (kôr′pŭs-'l). A very small cell floating in the blood. (p. 5)

CORTISONE (kôr′tĭs-ōn). A drug that has been found successful in treating arthritis. (p. 269)

COSMETIC (kŏz-mĕt′ĭk). Any substance put on the skin or hair to improve its appearance. (p. 236)

CRETINISM (krē′tĭn-ĭz'm). A defective mental and physical condition which is caused by the removal, injury, or inactivity of the thyroid gland. (p. 281)

DANDRUFF (dăn′drŭf). Small scales of epidermis which flake off from an unhealthy scalp. (p. 227)

DENTAL FLOSS (dĕn′tăl flŏs). A specially treated kind of strong, soft thread used to clean between the teeth. (p. 58)

DENTAL HYGIENIST (hī′jĭ-ĕn-ĭst). A person who has been trained to assist a dentist in certain ways. (p. 65)

DENTINE (dĕn′tēn). The substance of which the main part of a tooth is made. (p. 55)

DEPRESSION (dē̇-prĕsh′ŭn). A low state of physical and mental force. (p. 300)

DERMIS (dûr′mĭs). The layer of the skin underneath the top layer, or epidermis. (p. 229)

DIABETES (dī′ȧ-bē′tēz). A disease due to a lack of insulin. Insulin aids the body in its use of carbohydrates as a source of energy. (p. 282)

DIAGNOSIS (dī′ăg-nō′sĭs). Art or act of studying the symptoms and signs of diseases and from these symptoms learning the nature of a particular disease. (p. 9)

DIAPHRAGM (dī′ȧ-frăm). A broad dome-shaped muscle which forms the floor of the chest cavity and the roof of the abdominal cavity. (p. 98)

DIGESTION (dĭ-jĕs′chŭn). The process by which food is changed into a form which can be used by the body. (p. 21)

DILUTE (dĭ-lūt′). Make thin, less concentrated. (p. 27)

DIPHTHERIA (dĭf-thēr′ĭ-ȧ). An acute communicable disease in which whitish membranes are formed on the lining of the throat and other respiratory passages. (p. 4)

DISLOCATION (dĭs′lō̇-kā′shŭn). Displacement. (p. 146)

DISTILLED WATER (dĭs-tĭld′). Pure water made by condensing steam. (p. 79)

DUCTLESS GLANDS. Glands which pour their secretion directly into the blood stream. Also called *glands of internal secretion* and *endocrine glands.* The thyroid gland is an example. (p. 286)

DUODENUM (dū′ō̇-dē′nŭm). The first part of the small intestine, leading from the stomach to the main part of the small intestine. (p. 25)

DYSENTERY (dĭs′ĕn-tĕr′ĭ). A disease in which there is inflammation of the large intestine. (p. 268)

EARDRUM. The skin or membrane stretched across the canal of the ear. (p. 115)

ELECTRIC SHOCK. Injury caused by electricity passing through a person's body. (p. 204)

ELEMENT (ĕl′ē̇-mĕnt). A substance which cannot be separated into other substances by chemical processes. (p. 49)

ELIMINATION (ē̇-lĭm′ĭ-nā′shŭn). Act of sending out or expelling from the body. (p. 24)

EMOTIONAL (ē̇-mō′shŭn-ȧl). Showing strong feeling. (p. 4)

ENAMEL (ĕn-ăm′ĕl). The hard, white, shiny outer coat of the teeth. (p. 55)

ENDOCRINE GLANDS (ĕn′dō̇-krīn). See *ductless glands.* (p. 278)

EPIDERMIS (ĕp′ĭ-dûr′mĭs). The outer layer of the skin. (p. 229)

ERUPTION (ē̇-rŭp′shŭn). A rash breaking out on the skin or mucous membrane. (p. 237)

ESCALATOR (ĕs′kȧ-lā′tẽr). A moving stairway. (p. 184)

ESOPHAGUS (ē̇-sŏf′ȧ-gŭs). The passage for food from the mouth to the stomach. (p. 25)

FARSIGHTEDNESS (fär′sīt′ĕd-nĕs). A condition of the eye in which the eyeball is too short or the lens not convex enough, so that a person has difficulty in seeing clearly things at short distances from the eye. (p. 122)

FATIGUE (fȧ-tēg′). Weariness or loss of power from work or play. (p. 5)

FIBROUS (fī′brŭs). Consisting of or similar to hairlike fibers. (p. 32)

FLUORINE (flo͞o′ō̆-rēn). A chemical element of the chlorine family, which, when dissolved in water, seems to be important for good teeth. (p. 64)

FLUOROSCOPE (flo͞o′ō̆-rō̆-skōp). A machine useful in looking at inside parts of the body, such as the lungs. (p. 22)

FOCI OF INFECTION (fō′sī, ĭn-fĕk′shŭn). Places in the body where bacteria are gathered in large numbers. (p. 31)

FOCUS (fō′kŭs). A point at which rays of light or sound meet; the point at which an image is formed. (p. 123)

FRACTURE (frăk′tūr). The breaking of a bone. (p. 148)

FUNGUS (fŭng′gŭs). Any of a group of plants having no green coloring matter, as mushrooms, molds, and mildews. (p. 233)

GALL BLADDER. A small, baglike organ which holds the excess bile secreted by the liver. (Gall and bile are the same substance.) (p. 25)

GAMMA GLOBULIN (găm′*ȧ* glŏb′ū-lĭn). A substance which through injection will prevent polio. (p. 269)

GARGLE (gär′g′l). A liquid used in rinsing the throat. (p. 112)

GAS POISONING. A serious condition caused by breathing in harmful gases. The respiration may be stopped. (p. 204)

GASTRIC (găs′trĭk). Of or relating to the stomach. (p. 28)

GLAND. An organ of the body that secretes some useful fluid. (p. 5)

GLUCOSE (glo͞o′kōs). A kind of sugar which is formed in the body and carried by the blood. (p. 27)

GLYCOL (glī′kōl). A thick, sweet, colorless liquid sometimes used in a spray to reduce the number of germs in the air of rooms. (p. 110)

GOITER (goi′tẽr). Enlargement of the thyroid gland. (p. 281)

GRAM (grăm). The unit of weight in the metric system. About 28.35 grams make an ounce. (p. 48)

GULLET. The tube leading from the lower part of the throat to the stomach; the esophagus. (p. 25)

HAEMOGLOBIN (hē′mō̆-glō′bĭn). The coloring matter of the red blood corpuscles which carries oxygen to the body cells. It also serves as a means for carrying carbon dioxide from the tissues to the lungs for elimination. (p. 77)

HALITOSIS (hăl′ĭ-tō′sĭs). Bad breath. (p. 66)

HANGNAIL. A bit of skin which hangs loose at the side of a fingernail. (p. 233)

HEALTH EXAMINATION. A thorough testing of the parts and work of the body to determine its condition. (p. 9)

HEAT EXHAUSTION. A condition caused by too much heat. The person becomes cold and weak. Not the same as sunstroke. (p. 217)

HEROIN (hĕr′ȯ-ĭn). A white, powerful, habit-forming drug made from morphine. (p. 299)

HOOKWORM DISEASE. A disease or bodily injury caused by a small worm commonly found in certain parts of this and other countries. (p. 82)

HORMONE (hôr′mōn). A regulating substance secreted by a ductless gland into the blood stream. (p. 286)

HUMIDITY (hū-mĭd′ĭ-tĭ). Moisture in the air; dampness due to excessive water vapor in the air. (p. 6)

HYDROCHLORIC ACID (hī′drȯ-klō′rĭk). A chemical substance formed from hydrogen and chlorine. (p. 155)

HYPERACIDITY (hī′pẽr-*ă*-sĭd′ĭ-tĭ). A condition of excessive acidity, as in the stomach. (p. 36)

IMMUNE (ĭ-mūn′). Protected against some disease by substances in the blood that make certain bacteria and their poisons harmless. (p. 265)

IMPULSE (ĭm′pŭls). A driving onward. (p. 291)

INDIGESTIBLE (ĭn′dĭ-jĕs′tĭ-b′l). Not digestible, that is, not changeable for use as food. (p. 24)

INDIGESTION (ĭn′dĭ-jĕs′ch*ŭ*n). Poor digestion; discomfort during any part of the process of digestion. (p. 24)

INFANTILE PARALYSIS (ĭn′f*ă*n-tīl p*ȧ*-răl′ĭ-sĭs). An acute disease that comes mostly to babies and children. It spreads widely and often causes injury for life. (p. 269)

INFECTED (ĭn-fĕk′tĕd). Contaminated with any disease-producing thing. (p. 39)

INFECTION (ĭn-fĕk′sh*ŭ*n). The condition due to germs growing in the body and producing poisons. (p. 31)

INFLAMED (ĭn-flāmd′). Red, swollen, and often marked by heat and pain. (p. 37)

INFLAMMATION (ĭn-fl*ă*-mā′sh*ŭ*n). A condition which produces redness, swelling, and often pain. (p. 38)

INFLUENZA (ĭn′flo͝o-ĕn′z*ȧ*). An acute, communicable respiratory disease, more severe in its effects than a cold though having similar symptoms. (p. 5)

INJECT (ĭn-jĕkt′). To put or force in. (p. 84)

INOCULATE (ĭn-ŏk′ū-lāt). To inject weakened bacteria into the body for the purpose of making the body produce substances which will make harmless further attacks from the same type of bacterium. (p. 114)

INSANITY (ĭn-săn'ĭ-tĭ). Madness; lunacy. (p. 298)

INSULIN (ĭn'sŭ-lĭn). The internal secretion of the pancreas. An artificial preparation of insulin is used in the treatment of diabetes. (p. 282)

INTESTINE (ĭn-tĕs'tĭn). The bowels. The tubelike part of the digestive tract beginning below the stomach. (p. 25)

INVOLUNTARY (ĭn-vŏl'ŭn-tĕr'ĭ). Not under the influence or control of the will. (p. 161)

IODINE (ī'ŏ-dīn). A chemical substance and one of the important elements in the thyroid secretion. (p. 281)

IRIS (ī'rĭs). The colored part of the eye. (p. 123)

ISOLATE (ī'sŏ-lāt). To put off by oneself; to separate from other people. (p. 262)

KIDNEYS (kĭd'nĭz). Two organs that help to remove body waste in the urine. (p. 80)

LABORATORY (lăb'ŏ-rȧ-tō'rĭ). Workroom equipped for the experiments of a scientist. (p. 155)

LANOLIN (lăn'ŏ-lĭn). A fat obtained from sheep's wool; soothing to the skin. (p. 240)

LARYNGITIS (lăr'ĭn-jī'tĭs). Inflammation of the mucous membrane of the larynx. (p. 100)

LARYNX (lăr'ĭngks). The organ of voice in the air passage between the throat and the trachea (windpipe). (p. 96)

LAXATIVE (lăk'sȧ-tĭv). Having a tendency to relieve constipation by causing a mild bowel movement. (p. 39)

LENS. A transparent body (as in eyeglasses or in the eye or in a microscope) which is curved on one or both sides. It may be either concave or convex. (p. 121)

LIGAMENTS (lĭg'ȧ-mĕnts). Strong bands or membranes which hold the bones together. (p. 145)

LITMUS PAPER (lĭt'mŭs). A paper treated with a dyestuff which is turned red by acids and which is turned blue by alkalies. (p. 67)

LIVER (lĭv'ẽr). An organ that secretes bile and helps to keep the blood always of the same composition. (p. 25)

LONGITUDINAL (lŏn'jĭ-tū'dĭ-năl). Extending in length; placed or running lengthwise. (p. 152)

LUMBAGO (lŭm-bā'gō). A painful condition of the lower part of the back. (p. 270)

LYMPH (lĭmf). A fluid like blood, except that it contains no red corpuscles and is thinner — that is, less concentrated — than blood. (p. 78)

MALARIA (mȧ-lâr′ĭ-ȧ). A disease due to a microorganism in which the patient has attacks of fever at regular intervals. (p. 82)

MANICURE (măn′ĭ-kūr). To care for the hands and nails. (p. 233)

MARIJUANA (mä′rĕ-hwä′nä). A drug obtained from the hemp plant. It is usually smoked in cigarettes. (p. 300)

MARROW (măr′ō). A soft substance which fills the cavities of many bones. (p. 78)

MASSAGE (mȧ-säzh′). A method of treating some parts of the body by rubbing. (p. 64)

MASTOID (măs′toid). A bone back of the ear. The mastoids may become infected from the ear or throat. (p. 116)

MEASLES (mē′z’lz). A communicable disease in which the skin all over the body breaks out and the person has a fever. (p. 128)

MENINGITIS (mĕn′ĭn-jī′tĭs). A serious disease, caused by various bacteria, in which the covering of the brain and spinal cord is inflamed. (p. 267)

MICROORGANISM (mī′krŏ-ôr′găn-ĭz’m). A plant or an animal so small that it can be seen only under the microscope. (p. 107)

MICROSCOPE (mī′krŏ-skōp). An instrument which makes anything put under its lens look many times larger than it really is. (p. 40)

MINERAL. The part of food which is left as ashes after the food has been burned. It is useful in the building of bone material. (p. 13)

MOLAR (mō′lẽr). A tooth toward the back of the mouth with a broad grinding surface. (p. 60)

MOLE. A small growth on the skin. (p. 237)

MORPHINE (môr′fēn). A bitter, white drug that is found in opium. (p. 299)

MUCOUS MEMBRANE (mū′kŭs mĕm′brān). The thin layer of tissue lining certain cavities, such as the mouth and stomach. (p. 36)

MUCUS (mū′kŭs). A slippery, watery material formed by the mucous membranes which keeps them moist and helps to protect them. (p. 38)

MYOPIA (mī-ō′pĭ-ȧ). Nearsightedness. (p. 126)

NASAL (nā′z*ă*l). Of or relating to the nose. (p. 96)

NAUSEA (nô′shē̇-*ȧ*). Sickness of the stomach with a desire to vomit. (p. 30)

NAUSEATE (nô′shē̇-āt). To cause nausea. (p. 28)

NEARSIGHTEDNESS (nēr′sīt′ĕd-nĕs). A condition of the eye in which the eyeball is too long or the lens is too convex, so that one cannot see distant objects well. (p. 122)

NEUTRALIZE (nū′tr*ă*l-īz). To destroy the peculiar properties of; to make neutral or ineffective. (p. 67)

NIACIN (nī′*ȧ*-sĭn). One of the B vitamin family important in the prevention of pellagra. It is also called *nicotinic acid.* (p. 46)

NICOTINE (nĭk′ō̇-tēn). A poisonous substance contained in tobacco. (p. 89)

NOSE DOUCHE (dōōsh). A means of washing out the nose with certain liquids. It may be harmful. (p. 117)

OCULIST (ŏk′ū̇-lĭst). A physician especially prepared to treat the eyes. (p. 121)

OPERATION (ŏp′ẽr-ā′sh*ŭ*n). A surgical act on the living body for remedial effect. (p. 116)

OPIUM (ō′pĭ-*ŭ*m). A powerful habit-forming drug obtained from the juice of a poppy. (p. 299)

OPTICIAN (ŏp-tĭsh′*ă*n). A person, not a physician, who makes or sells glasses and other things for the eyes. (p. 130)

OPTIC NERVE (ŏp′tĭk). The nerve that carries messages from the retina to the brain to give us vision. (p. 124)

OPTOMETRIST (ŏp-tŏm′ē̇-trĭst). One who is skilled in testing the eyes and in fitting glasses to them; not a physician. (p. 121)

ORGAN (ôr′g*ă*n). A part of the body or group of tissues that performs special, important duties. (p. 22)

ORGANISM (ôr′g*ă*n-ĭz′m). Any living thing. (p. 107)

OXYGEN (ŏk′sĭ-jĕn). A gas having no color, no odor, no taste. It is breathed with the air and is necessary for life. (p. 3)

PACIFIER (păs′ĭ-fī′ẽr). An object sometimes given to a baby to put into his mouth to keep him quiet. (p. 56)

PALPITATION (păl′pĭ-tā′sh*ŭ*n). Rapid beating of the heart; a throbbing, as of the heart. (p. 90)

PANCREAS (păn′krē̇-*ă*s). A gland which pours a digestive juice into the small intestine and insulin into the blood. (p. 25)

PANCREATIC (păng′krē̇-ăt′ĭk). Of the pancreas. (p. 31)

PARALYSIS (p*ȧ*-răl′ĭ-sĭs). Loss of power to move voluntarily or to feel. (p. 89)

PARASYMPATHETIC NERVOUS SYSTEM (păr′ȧ-sĭm′pȧ-thĕt′ĭk). Part of the autonomic nervous system which controls digestion and other vital processes. (p. 287)

PARATHYROID (păr′ȧ-thī′roid). The name of four tiny ductless glands located near the thyroid gland. (p. 279)

PATENT MEDICINE. A ready-made medicine which is sold in the stores under government permission. (p. 9)

PEDESTRIAN (pė̆-dĕs′trĭ-ăn). A walker. (p. 176)

PELLAGRA (pĕ-lā′grȧ). A disease due to a deficiency of vitamin B_2 in the diet. (p. 271)

PENICILLIN (pĕn′ĭ-sĭl′ĭn). A drug made from a mold that has proved very effective in the treatment of certain infections. (p. 116)

PERSPIRATION (pûr′spĭ-rā′shŭn). Sweat; a salty, watery liquid secreted by the sweat glands and oozing from the skin. (p. 5)

PERSPIRE (pẽr-spīr′). To sweat; to have a salty, watery liquid secreted by the sweat glands ooze from the skin. (p. 5)

PHOSPHORUS (fŏs′fŏ̇-rŭs). An element which in various compounds is an essential part of the cells of teeth and bones and all other body cells. (p. 46)

PHYSIOLOGICAL (fĭz′ĭ-ŏ̇-lŏj′ĭ-kăl). Relating to the work which an organ or a tissue performs. (p. 10)

PHYSIOLOGIST (fĭz′ĭ-ŏl′ŏ̇-jĭst). A person who knows a great deal about physiology. (p. 34)

PHYSIOLOGY (fĭz′ĭ-ŏl′ŏ̇-jĭ). The study of the processes or changes that go on in living animals and plants. (p. 15)

PIGMENT (pĭg′mĕnt). A coloring matter. (p. 229)

PIMPLE (pĭm′p′l). A small, pointed, raised spot on the skin with pus inside. (p. 227)

PINKEYE (pĭngk′ī′). An acute, contagious disease of the mucous membrane of the eye. (p. 123)

PITUITARY (pĭ-tū′ĭ-tĕr′ĭ). The name of a small, oval gland of internal secretion located just below the brain. (p. 279)

PLASMA (plăz′mȧ). The watery part of the blood. Plasma is more than 90 per cent water. It is a solution of salts, sugar, and a protein material like the white of egg. (p. 76)

PNEUMONIA (nŭ̇-mō′nĭ-ȧ). A disease in which there is a serious inflammation of the lungs. (p. 8)

POSTURE (pŏs′tŭ̇r). The position of the body, as in sitting, standing, or walking. (p. 43)

PRECIPITATED CHALK (prė̆-sĭp′ĭ-tā′tĕd). A white powder used in making tooth pastes and tooth powders. (p. 67)

PRESCRIPTION (prē̆-skrĭp′shŭn). A written direction for the preparation and use of a medicine. (p. 10)

PRIMITIVE (prĭm′ĭ-tĭv). Relating to the beginning of things or to early times. (p. 18)

PROTOPLASM (prō′tō̆-plăz'm). The living matter of cells. (p. 37)

PSYCHOSOMATIC (sī′kō̆-sō-măt′ĭk). The influence of mind on body and body on mind. (p. 271)

PULP CAVITY. A hollow space in the middle of a tooth filled largely with blood vessels and nerves. (p. 55)

PULSE RATE. The frequency per minute of the beat which is felt in the arteries each time that the blood is sent out from the heart. (p. 71)

PUPIL. The opening in the iris of the eye. (p. 123)

PURIFY (pū′rĭ-fī). To free from harmful or waste matter. (p. 81)

PUS. A yellowish mass of white corpuscles, bacteria, living and dead, and injured tissue, formed at a point where bacteria are located. (p. 39)

PUTREFACTION (pū′trē̆-făk′shŭn). Decay. (p. 33)

PYORRHEA (pī′ŏ-rē′ȧ). A disease of the gums in which there is usually a discharge of pus and the teeth often become loose. (p. 58)

QUACK. A person who has little or no medical skill but who pretends to cure diseases. (p. 270)

QUARANTINE (kwŏr′ăn-tēn). A method of preventing the spread of communicable disease. The person who is sick or may have the germs in his body is isolated for a certain length of time. (p. 262)

RADIOISOTOPES (rā′dĭ-ō-ī′sō-tō-pēz). Radioactive elements used to detect the causes of disease. (p. 270)

RELAX. To make slack, or loose, or less tense. (p. 28)

RESISTANCE (rē̆-zĭs′tăns). Ability to resist bacteria, infections, or fatigue. (p. 8)

RESPIRATORY (rē̆-spīr′ȧ-tō′rĭ). Of or pertaining to the act of breathing. (p. 94)

RETINA (rĕt′ĭ-nȧ). The inner nerve lining or coat at the back of the eyeball which receives the images of objects you look at and is connected with the brain by the optic nerve. (p. 123)

RHEUMATIC FEVER (rōō-măt′ĭk fē′vẽr). An acute disease, usually in children and young people, which may cause pain in and around the joints and harm the heart. (p. 17)

RHEUMATISM (rōō′mȧ-tĭz'm). A disease in which there is stiffness or pains of various kinds, especially in the joints and muscles. (p. 53)

RIBOFLAVIN (rī′bṓ-flā′vĭn). One of the vitamin B family necessary for good nutrition. (p. 46)

RICKETS (rĭk′ĕts). A bone disease usually affecting children and caused by a poor diet. (p. 150)

RINGWORM. A contagious skin disease due to a certain fungus that lives on the skin or scalp. (p. 227)

RUPTURE (rŭp′tū̆r). To break apart or burst, as to rupture a blood vessel. (p. 39)

SALIVA (s*ȧ*-lī′v*ȧ*). The watery fluid secreted by the glands of the mouth. (p. 24)

SALIVARY (săl′ĭ-vĕr′ĭ). Of or relating to or producing saliva. (p. 25)

SALLOW (săl′ō). Of a pale, sickly, yellowish color. (p. 243)

SANITARY (săn′ĭ-tĕr′ĭ). Of or pertaining to health; hygienic. (p. 250)

SCALP. The part of the head that is usually covered by hair. (p. 231)

SCARLET FEVER. A contagious disease in which the throat is sore, the skin is red and rough, and there is a fever. (p. 85)

SECRETE (sē̇-krēt′). To discharge from gland cells a special substance made from material taken from the blood. (p. 52)

SECRETION (sē̇-krē′sh*ŭ*n). A substance which is made by glands. (p. 32)

SENSATION (sĕn-sā′sh*ŭ*n). Any feeling. A state of consciousness or awareness produced by an object outside of the body or by a change in the body. (p. 35)

SERUM (sēr′*ŭ*m). The watery part of the blood that is left after the blood has clotted. (p. 76)

SERUM ALBUMIN (sēr′*ŭ*m ăl-bū′mĭn). A part of the blood found in plasma. (p. 269)

SHOCK (shŏk). Weakness following an injury or severe strain to the nervous system. It may be serious. (p. 80)

SINUS (sī′n*ŭ*s). A hollow space in certain bones of the face. (p. 102)

SMALLPOX (smôl′pŏks′). A contagious disease which leaves ugly marks on the skin. (p. 264)

SODIUM SULPHITE (sō′dĭ-*ŭ*m sŭl′fīt). A chemical sometimes used to keep food from spoiling. (p. 37)

SOLUBLE (sŏl′ū̇-b’l). Able to be dissolved in a liquid. (p. 27)

SOUNDPROOF. Able to keep sounds from entering or escaping. (p. 295)

SPINAL CORD (spī′n*ă*l). The thick cord of nervous tissue within the spinal column extending from the brain to the lower end of the spinal column. (p. 146)

SPLEEN (splēn). An organ near the stomach and intestine. Red blood corpuscles are broken down in the spleen. (p. 78)

STERILE (stĕr′ĭl). Free from germs. (p. 63)

STIMULATE (stĭm′ū-lāt). To excite to activity. (p. 40)

STIMULUS (stĭm′ū-l*ŭ*s). Anything that causes activity in a nerve or muscle. Something that rouses the mind or spirits. The plural is *stimuli.* (p. 39)

"STREP" INFECTION (strĕp). *Strep* is short for *streptococcus,* a bacterium that causes serious disease by getting into the lungs, blood, sinuses, or other parts of the body. (p. 267)

STREPTOMYCIN (strĕp′tō-mī′sĭn). A new drug particularly useful against tubercle bacilli and bacteria that live in the intestine. (p. 261)

SUBCUTANEOUS (sŭb′kū-tā′nē-*ŭ*s). Situated under the skin. (p. 225)

SUFFOCATION (sŭf′ō-kā′sh*ŭ*n). Not being able to breathe, as when the lungs are filled with water or harmful gases. (p. 204)

SULFA DRUG (sŭl′f*ȧ*). One of a family of chemicals used to cure pneumonia and certain other infections. (p. 267)

SULFONAMIDE (sŭl′fōn-ăm′ĭd). A chemical substance used to kill certain germs within the body. It has been used to cure pneumonia, meningitis, and other diseases. (p. 116)

SULPHUR DIOXIDE (sŭl′fẽr dī-ŏk′sīd). A chemical compound sometimes used to keep food from spoiling. (p. 37)

SUNSTROKE. A condition due to too much exposure to the sun. The person becomes hot and weak. Do not mistake sunstroke for heat exhaustion. (p. 217)

SUPERSTITION (sū′pẽr-stĭsh′*ŭ*n). A belief which is not based on facts. (p. 234)

SURGICAL (sûr′jĭ-k*ă*l). Relating to the art of healing by means of cutting or other manual operation. (p. 127)

SUSCEPTIBILITY (s*ŭ*-sĕp′tĭ-bĭl′ĭ-tĭ). Sensitiveness; liability to get a certain disease. (p. 111)

SWEETBREAD. Either of two glands of an animal used for food, as the pancreas, called the *stomach sweetbread.* (p. 31)

SYMPATHETIC NERVOUS SYSTEM (sĭm′p*ȧ*-thĕt′ĭk nûr′v*ŭ*s sĭs′tĕm). A combination of nerves and nerve centers which help to keep all the internal organs working together smoothly and steadily. (p. 75)

SYMPTOM (sĭmp'tŭm). A sign or an appearance or a feeling which shows that a person is sick. (p. 31)

TARTAR (tär'tẽr). A substance that often forms on the teeth, consisting of saliva, animal matter, and phosphate of lime. (p. 62)

TENDON (tĕn'dŭn). A tough cord or band of fibrous connective tissue uniting a muscle with a bone or some other part. (p. 160)

TERRAMYCIN (tĕr'ȧ-mī'sĭn). A new drug, valuable in treating illnesses of the respiratory tract. (p. 268)

TETANUS (tĕt'ȧ-nŭs). A painful, often fatal disease caused by one kind of bacterium and marked by continuous uncontrolled contractions of certain muscles. Also called lockjaw. (p. 261)

THIAMIN (thī'ȧ-mĭn). Vitamin B_1. Lack of thiamin affects the growth, appetite, and nerves. (p. 46)

THYROID (thī'roid). The name of a large ductless gland in the neck. (p. 279)

TISSUE (tĭsh'ū). A collection or mass of similar cells which perform a similar activity. (p. 9)

TONSIL (tŏn'sĭl). One of a pair of spongy growths at the back of the mouth. (p. 84)

TONSILLITIS (tŏn'sĭ-lī'tĭs). An inflammation of the tonsils caused by bacteria. (p. 100)

TOXIN (tŏk'sĭn). Poison produced by disease germs. (p. 42)

TOXIN-ANTITOXIN (tŏk'sĭn-ăn'tĭ-tŏk'sĭn). A mixture of toxin and antitoxin injected into the body to stimulate it to produce substances which will neutralize similar toxin in the future. (p. 266)

TOXOID (tŏk'soid). A form of weakened toxin used very successfully with babies less than a year old and with young children, in place of toxin-antitoxin, to prevent them from getting diphtheria. (p. 266)

TRACHEA (trā'kē-ȧ). The windpipe. (p. 96)

TRACHOMA (trȧ-kō'mȧ). A disease of the lining membrane of the eyelids due to certain bacteria. (p. 128)

TRANSVERSE (trăns-vûrs'). Running or being across. (p. 152)

TUBERCULIN (tū-bûr'kū-lĭn). A sterile liquid containing certain substances from the tubercle bacillus. (p. 274)

TUBERCULOSIS (tū-bûr'kū-lō'sĭs). A communicable disease caused by the tubercle bacilli. (p. 82)

TYPHOID FEVER (tī'foid). A very serious disease caused by a certain kind of bacterium (the typhoid bacillus), usually carried by food or drink. (p. 4)

ULTRAVIOLET LIGHT (ŭl′trȧ-vī′ŏ-lĕt). Invisible rays of light beyond the violet rays of the spectrum of sunlight. (p. 105)

URINE (ū′rĭn). A fluid excreted from the kidneys. (p. 282)

VACCINATION (văk′sĭ-nā′shŭn). Injecting a substance into the body to prevent one of certain diseases. For example, smallpox is prevented by injecting a small amount of the smallpox virus, which will cause the body to produce substances that protect the person from smallpox. (p. 265)

VACCINE (văk′sēn). Weakened germs, extracts of germs, or killed germs of a certain kind which can be put into the body to protect it against any of certain diseases, as smallpox. (p. 261)

VALVE. A structure which closes a passage for a short time or permits the flow of liquid in one direction only. (p. 73)

VARICOSE VEINS (văr′ĭ-kōs). Veins which are weakened and relaxed, causing a lumpy and swollen appearance. (p. 88)

VEIN (vān). A blood vessel which carries blood back toward the heart. (p. 72)

VENTILATING SYSTEM (vĕn′tĭ-lāt′ĭng sĭs′tĕm). A means of supplying rooms with fresh, clean, gently moving air of the right temperature. (p. 118)

VENTRICLE (vĕn′trĭ-k’l). One of the two lower cavities of the heart. (p. 73)

VIRUS (vī′rŭs). A microorganism, smaller than a bacterium, which may cause one of certain diseases. (p. 107)

VISUAL (vĭzh′ū-ăl). Relating to the eyes and vision. (p. 131)

VITAMIN (vī′tȧ-mĭn). A substance found in small quantity in food, yet necessary for growth and health. (p. 16)

VOLUNTARY (vŏl′ŭn-tĕr′ĭ). Produced by an act of choice; subject to the will. (p. 146)

WART (wôrt). A small growth on the skin. A wart differs from a mole in that it usually has no pigment. (p. 237)

WHOOPING COUGH (hōōp′ĭng kŏf). A disease that is spread from person to person, especially among children. The patient coughs violently. (p. 268)

WINDPIPE. The tube which carries the air you breathe down to the lungs; the trachea. (p. 37)

X RAY. Ray which can pass through many substances which light rays cannot pass through. (p. 66)

YELLOW FEVER. A disease caused by a microorganism carried by a certain kind of mosquito. (p. 263)

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